THE

ELECTRICAL REVIEW.

VOL. LXI. JULY 12, 1907. No. 1,546.

ELECTRICAL REVIEW.

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THE

UNIVERSAL ELECTRICAL DIRECTORY

(J. A. BERLY'S).

1907 EDITION.

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London, E.C.

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. *Established 1872.*

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGEKKAY, LONDON." Code, A B C.

Telephone Nos. Holborn 933; Central 4425 (Editorial only).

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THE CARSHALTON ACCIDENT.

WE noted briefly in our last issue Major Pringle's report on this accident, but it is worth more than those few words.

The features of the accident which led to the overturning of a crowded car and the loss of two lives will be within the memory of our readers. The car was of the standard four-wheeled double-deck pattern with no top cover. Its seating accommodation was 22 inside and 33 outside, but on this trip it appears that there were 22 inside and from 43 to 47 outside. As 10 of these were children under five years old, the overcrowding was not so great as the bare figures indicate.

The brakes were simple, consisting of the ordinary hand-operated wheel blocks, and the rheostatic electric brake, of both of which it may be said that their action depends upon the wheels revolving without sliding so long as the car is in motion.

There were four sand boxes, two of which would be in use at once on the leading wheels, the additional complication of rods and levers for coupling the four boxes together having received very little support in this country.

Loose sand pedals being easily lost, and pedals left sticking out of the rear platform being a source of nuisance to passengers, and of expense to the tramway through claims for torn dresses, it has been customary on many systems to supply each driver with one pedal only, which he is supposed to take with him when changing platforms at termini. Should he forget to do so, neither he nor the conductor can drop sand, as the trailing boxes are placed behind the wheels.

The weather was warm and sunny, and the driver would be likely to leave the sand pedal on one platform all day, as the rails were not greasy except where the water-cart had plied. Here we have one contributory to the accident, for the evidence shows that the pedal was on the rear platform, and that the hill and curve had been watered recently.

The driver was a spare man put on to meet the Bank Holiday requirements, and he had not previously taken a fully-loaded car over this route.

The conductor evidently knew little about the mechanism of the car, or lost his head so completely as to forget anything he had learned, for he repeated what has been done in so many of these accidents, by trying to pull on the hand-brakes from his platform.

The hill down which the car ran away is straight for 500 yards, and nowhere after the first 3 chains does the grade exceed 1 in 23, flattening to 1 in 36 over the last 200 yards. At the end of the straight there is a right-angle bend on a falling gradient of 1 in 32. The outer rail was super-elevated $\frac{5}{8}$ in. at the tangent, and $1\frac{1}{2}$ in. at the centre of the curve.

It is needless to say that the Board of Trade inspector had fixed certain compulsory stops, and had limited speeds both on the hill and on the curve, and it is, perhaps, equally unnecessary to add that these regulations were disregarded.

The driver lost control of the car a short distance beyond the railway bridge at the top of the hill, and never regained it. The wheel brake was hard on when the car overturned, and the rheostatic brake was put out of action by the wheels being locked. Major Pringle rightly blames the driver for starting the accident by over-running the safe speed, and holds the conductor responsible for locking the wheels, but it is possible that the driver was at fault in both cases for his evidence as to his actions cannot be considered trustworthy, and he would have followed precedent if he neglected to release the hand-brake when he discovered that its application to wheels travelling over a greasy rail had caused them to slide, in which case the conductor's efforts to apply the brake from his end would have no effect. On the other hand, if the driver really did release the brake and the conductor took up the slack as fast as the driver let it go skidding would continue; and, unless it happened that the combined efforts of these men brought the brake levers to a middle position in which the blocks were just free or just not so hard on as to skid the wheels, the rheostatic brake would be inoperative. If the conductor did lock the wheels he is not so much to blame as the system which put it in his power to do so.

In order to use sand with effect it is necessary to release the brake momentarily if the wheels have begun to slide, but the driver had cut himself off from the supply of sand by leaving the pedal on the other platform. The safety of passengers should not be allowed to turn on such forgetfulness or negligence, and for some years a special form of disappearing pedal has been available, which removes the only objection to the provision of a separate pedal for each platform. This pedal is not removable, and when not in use is dropped flush with the platform by giving it a half-turn. The tramway company can hardly be blamed for the accident on this ground, as there is no doubt that the regulations as to the driver taking the pedal with him were strict and well known; and it is probable that in the actual circumstances the use of sand would have had little effect upon the speed; but there should be no delay in fitting to every car in the country which does not possess them already, two pedals which cannot be removed.

Major Pringle draws attention to the employment of inexperienced drivers, a matter which has received frequent notice in this Journal. During the past few years training schools, of a more or less elaborate nature, have increased in number, and municipal tramways in particular have been active in this direction, but there is a great deal to be accomplished before the whole body of tram-car drivers reach the same degree of proficiency and nerve as their collaterals the locomotive drivers, and the danger of employing unseasoned men is especially exemplified by such accidents as that at Carshalton.

When traffic is slack, and running conditions are good, the inferior and superior motormen are not easily distinguished; but the rub comes when all the spare men available are put on the heaviest service of the year. In order to cope with holiday traffic a "spare list" is a necessity, but the idea that this is a black list, or a list of raw novices, ought to be no longer in fashion. By a proper system of rotation, or by training men to be drivers or conductors indifferently, there should be no difficulty in putting a competent man on the front of every car, in no matter what emergency.

Finally, we would say that the combination of a hand-brake with a rheostatic brake, without the provision of some form of emergency brake which is independent of either, is a mistake which leads to the direst calamities.

PROPOSED ELECTRICAL EXHIBITION.

It will be remembered that at the annual meeting of the National Electrical Manufacturers' Association, there was a discussion in regard to the proposition to hold another big electrical exhibition. Among the things then made plain were these:—

1. Manchester trade was booming, and an exhibition there would be in the city or district before long, whether the National Manufacturers said nay or yea. Mr. Longbottom, who is well qualified to speak in regard to the matter, said, in effect, "Now is the time to act, if at all!"

2. The manufacturers did not want an exhibition run over their heads: they would be willing to fall in if their hands were forced, but they really did not think that they wanted another exhibition for another year or two, and some said plainly that they would not desire it then.

3. The majority of opinion adverse to a thorough-going effort at an early date was a very narrow one indeed.

Now we do not for one moment wish to underestimate the importance of the Association—it is the largest organisation, numerically, that we have representing our electrical manufacturing interests, though the vote at the meeting was only 9 to 8. Nor do we doubt that were the members of the Association to entirely withhold their support from such a show it would seriously suffer. But we would urge that while the matter is still under consideration, the manufacturers should look at it in the broadest possible manner from the standpoint of the electrical industry, and not purely from the direct-return and personal interest point of view. We venture to suggest that most of those who took part in the discussion referred to would profit from the early booming of electric lighting and power in any large industrial centre. Then, again, as the contracting interests stand to gain also from any such booming, is it an altogether impossible suggestion that some valuable co-operation and support might be looked for from that direction? Is not the honorary organiser of the Manufacturers' Association also the honorary organiser of the Contractors' Association? and is not this one of those matters in which reconciliation and co-operation might lead to an excellent result for the good of all parties? We know that there is a feeling that sometimes by one firm exhibiting a rival is aided and the exhibitor is little the better, but we do not regard isolated instances of that sort of thing as a strong argument against the holding of a really large and representative exhibition. We incline to the view that electric light and power supply are bound to make headway the more popular the knowledge of, and acquaintance with, them become.

May we remind that one of the most powerful influences which led to the organisation of the Olympia Show of 1905 was the success of the Gas Exhibition that preceded it. Are we to wait until the gas interests make another big effort, and then to follow on their heels? The very narrowness of the majority against exhibiting seems to us to be a call for a canvass of the electrical manufacturing and supplies trades and of the principal electrical contracting firms, to see what is the real feeling. When important electrical exhibitions are promoted in some of the principal industrial and populous centres, boycotting does not pay. The Newcastle exhibition was a case in point. True, members of the Association were not nominally present, but their exhibits were, and there are such things as local agents, as some of them then found out.

The object of the Association no doubt is good in so far as it is designed to keep out private promoting parties, whose desire it may be to run electrical exhibitions mainly for their own personal profit, leaving exhibitors to make whatever they can after they have borne a heavy burden of expense. But let us not keep out the poachers for the mere sake of doing so. We are confident that, as the result of the investigations and negotiations of the last month or two, the Association Committee will have more satisfactory material in hand to guide it than the mere showing of hands at the meeting mentioned.

We understand that the Committee will meet on the 16th inst. to consider this and other matters, and we hope that the views to which we have given expression above will have a sympathetic consideration. We do not wish to advocate an exhibition if it is not felt that it is needed, but let there be very strong evidence that such is the case before a definite decision is pronounced.

Two Conventions: A Suggestion.

AMERICAN commercial methods are frequently rated at higher efficiency than those appertaining in this country, especially as applied to the electrical industry. Whether or not the actual results confirm this opinion, is a debatable point; but the efforts made in America to attain this efficiency are certainly greater than similar efforts in Great Britain, and this is amply proved by the report to hand of the Thirtieth Convention of the National Electric Light Association, held at Washington, U.S.A., June 4th to 7th, when we compare it with the deliberations of the Convention of the I.M.E.A. recently held at Sheffield.

In the chairman's opening remarks at Washington, he refers to a previous Convention held in that city some thirteen years ago, and states that "then the dominating thought was technical, mechanical and electrical. The American, in whatever he does, moves rapidly. In operating limitations development toward the practical, if not the ideal, has about been reached, and now the predominating thought in a Convention such as this, while giving due regard to engineering problems, tends more especially to the commercial development, and in broad questions of management which, in the highest sense, affect our relations with the general public."

We certainly do not concur with the proposition that "development towards the practical, if not the ideal" in operating limitations, has in any way been approached, but we do agree that the predominating thought must be given to the commercial development of the industry. We cannot say that the deliberations of the American Convention were in any way more brilliant than those of the Sheffield Convention, where individual opinions were given and desultory discussion was held which fizzled into nothingness, but in this country there is something radically wrong with the present system of discussing matters of really national importance, among which all questions relating to the future development of the electrical industry undoubtedly rank.

It appears to us to be absolutely farcical that an individual should devote a great amount of time and labour in the production of a paper upon a given subject, and that afterwards a number of individuals should devote their energy and eloquence to prove that such time and labour has been hopelessly wasted. In America the method appears to be totally different. We infer from the proceedings that a Committee is formed to consider each subject set down for discussion at the Convention next following, and to one member of each Committee is allotted the task of setting forth the views arrived at by the whole.

A system similar to this could, with advantage, be adopted by the I.M.E.A., and we throw out the following suggestion which probably the newly-elected Council of that body may deem not unworthy of consideration. To save time and expense of travelling, district Committees may be formed and a subject for consideration at the next Convention allocated to each. The subject would be discussed from time to time during the year, and a member of the Committee, preferably the secretary, appointed to frame the paper. The subject would then be presented to the Convention in a mature form, and would represent the opinions of a section of the country instead of an individual only. The co-operation of members thus enjoined would tend to benefit the Association in a greater degree than the present system, which simply brings to the fore the individual at the expense of the time, toleration, and commiseration of the majority of the members.

A further advantage accruing from the adoption of such a course would be that each district would have representation upon the Council of the I.M.E.A. The present constitution of the Council is glaringly defective, as not a single representative of the metropolitan area has been elected.

The Faculty of Commerce at the Birmingham University.

WE had an opportunity in the ELECTRICAL REVIEW for February 1st last of calling attention to the Advisory Board of Business Men, recently created to co-operate with the Faculty of Commerce of the University at Birmingham. Within the past week or so the Board has issued a "précis" of the objects of the Faculty, a circular which is addressed to large employers of labour and others, drawing their attention to the assistance which the Faculty of Commerce is now prepared to give to the commercial community. The circular starts by pointing out in very reasonable language that the men who have been trained, and have become thoroughly competent to undertake the departmental administration of large concerns do not, as a rule, prove quite successful when advanced to the position of general managers. When the opposite plan is adopted of promoting to the general managership a clerk from the commercial department, the results are also liable to be disastrous, because the man has not sufficient knowledge to control the departmental experts under him. It is also well remarked that in such business houses as banks, the strict discipline necessary in subordinate grades of service does not tend to develop that sound and quick judgment which is required by the supreme head. The circular goes on to say that the aim of the Faculty of Commerce is to devise a system of training which, following upon a liberal education, shall be a suitable instruction for a general manager; that, indeed, the Faculty shall do for commercial work similar in character to that undertaken for the army by the Royal Military Academy, and the Royal Military College. It is added that several members of the Advisory Board of eight gentlemen who sign the précis have already selected employés from among the graduates of the Faculty, and that they are satisfied with the results. The course of training lasts three years, embracing subjects specially chosen to bring out the broader qualities necessary in men who aspire some day to fill positions of great responsibility; the syllabus being given in full in the "Programme of Study" contained in a pamphlet by the Dean of the Faculty (Prof. W. J. Ashley) entitled, "The Faculty of Commerce in the University of Birmingham, its Purpose and Programme."

Uninsulated Cables.

THE use of naked conductors carrying high pressure currents is so infrequent in this country, except on railways or other enclosed property, that it is not often that questions of liability for actions caused thereby come before the Courts for discussion. In America, however, actions of this kind appear to be very frequent. In a curious case recently noted in *The Central Station*, an action was brought in the State of New York by a boy to recover damages against a power company for injuries sustained in the following circumstances. It appeared that the company had conductors suspended in a street. The conductors were generally insulated, but at one point where they passed over a tree they were not insulated. The boy climbed the tree from the street and sustained a severe shock. The first Court held that the company were not liable; but the Supreme Court reversed this decision. In the course of the judgment it was stated: "This was a little tree abounding in branches almost extending to the ground, just such a tree as a small boy in any community would be attracted to. . . . . It is idle for the appellee (*i.e.*, the defendant company) to insist that it was not bound to have reasonably expected the small boys of the neighbourhood to climb that sort of a

tree . . . . The immemorial habit of small boys to climb little oak trees filled with abundant branches reaching almost to the ground, is a habit which Corporations stretching their wires over such trees must take notice of. This Court, so far as the exertion of its power in a legitimate way is concerned, intends to exert that power so as to secure, at the hands of these public Corporations, handling and controlling these extraordinarily dangerous agencies, the very highest degree of care and skill." Although we may be astonished at the high-flown language used by the Supreme Court, there can be no doubt that the principle underlying the judgment is derived from, and still recognised in, our English Courts. A man must not leave a dangerous machine in such a position that children of tender years, in the ordinary course of play, may come in contact with it. We recall one case, in which a wooden fence adjoining a highway was in an unsafe condition. A child climbed upon it, with the result that it fell and injured him. The owner of the fence was held liable.

A Berlin Electricity Tax.

It is reported in Berlin that the "magistrate" is having information collected in respect of all independent electric lighting installations in that city, that is, of those which generate their own supply of energy. The object in view is the proposed imposition of an electricity tax. It is calculated that the number of self-contained installations of the kind is approximately 500 and that they have a very considerable output. The Berlin Electricity Works Co., which has a monopoly of private supply, has to pay a tax to the Municipal Council for the use of the streets for the laying of cables, but the independent plants have hitherto been free from taxation, although it is not stated that they make use of any portion of the streets in connection with their systems. It is alleged that the working of these large installations has a disturbing effect and is injurious from the hygienic point of view, and that the levying of a tax would therefore be justified. This allegation is, however, deemed to be absurd, and later information on the whole question represents that the idea of taxation was suggested by a municipal official and readily seized upon by a few municipal councillors. The scheme, according to further details, does not aim at the owners of self-contained installations which produce light and power for their own particular use, but at the proprietors of the many plants which are employed for supplying blocks of buildings and which are termed block installations. It is considered that the scheme for imposing a tax on these plants will not receive much support in official quarters and that it is therefore foredoomed to failure.

Death-Roll of Paraffin, Gas and other Illuminants in Germany.

Herr Schafer, a well-known coal gas engineer of Germany, has recently been making a collection of the accidents that occurred throughout the whole Empire of Germany during the year 1906, in which human life was lost or imperilled by the use of the more common artificial illuminants and heating agents. The figures, omitting all cases where the fires or explosions harmed property only, are as follows :—

No. of	Coal gas.	Electricity.	Petroleum oil.	Spirit.	Benzine.	Acetylene.
Accidents ...	112	42	199	119	53	24
Men killed ...	41	35	127	58	15	10
Men injured...	149	46	218	140	62	34

Calculation shows that paraffin was responsible 44·4 per cent. of the deaths, denatured alcohol for 20·3 per cent., coal gas for 14·3 per cent., and electricity for only 12·2 per cent. A great many of the fatal electrical accidents were due to carelessness, drunkenness and foolhardiness, while two were caused by endeavours to obtain a surreptitious supply of current. Less widely used heating and lighting agents, such as pressure and suction producer gas, air gas, blast furnace gas, oil gas, and compressed coal gas, are excluded from Herr Schäfer's table and figures.

INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

(*Concluded from page* 5.)

Depreciation.

It is to be regretted that Mr. C. H. Yeaman in presenting the subject of "Depreciation" for discussion, did not provide sufficient material to allow the members of the M.E.A. much scope for the expression of their opinions. At the outset the writer stated that he "anticipates the expression of very varied opinions upon the views and arguments put forward," and that the discussion would "tend towards a more general agreement as to the best and safest course to adopt." We have, however, failed to find any "views" other than extracts from various sources, and of "arguments" there are none; but the words of the writer's own summing up, that "he has very briefly (?) endeavoured to assert the fundamental importance of *acknowledging*, rather than *ignoring*, the existence of depreciation," convey a fairly good idea of the importance of the contribution.

Now, why it should be made compulsory to wade through 21 pages of the I.M.E.A.'s *Proceedings* in order to arrive at the conclusion that it is important to *acknowledge* the existence of depreciation, we cannot understand. Will Mr. Yeaman, or anyone else, inform us of any undertaking, municipal or otherwise, that does not acknowledge such existence ?

It is a poor compliment to pay to the intelligence of municipal engineers and chairmen of electricity committees of this country, to be called together in conference, simply for the purpose of *acknowledging* the existence of depreciation, and then, after "the expression of very varied opinions," "to the accountant is left the precise calculations necessary to deal with every given case."

In our opinion, it is a pity that this opportunity should have been lost for placing before the members of the Association a definite system of depreciation which might have been adopted generally by all local authorities.

There is one point mentioned in Mr. Yeaman's paper, that we particularly emphasise, viz. : "It is very desirable that the expenditure upon each item, and against each sanction, should be shown, or at least known, by the accountant, and also that the amount redeemed should be ascertainable, so, in the event of displacement, the exact amount outstanding can be wrttten off." This is not only desirable, but should be made compulsory by the Local Government Board, and is, as a matter of fact, now insisted upon by the L.G.B. auditor in the Metropolitan area.

It is positively certain that should compulsory depreciation be established, a standard system of prime costing must also be instituted; the "too common practice of lumping all sanctions together on one side of the capital account," should certainly be abolished. The importance of accurate accountancy in municipal electricity undertakings is on a par with the importance of skilful engineering ; why then should not accountants be admitted to the deliberations of the I.M.E.A., and papers of a similar nature to that under review be dealt with from the accountancy side, as well as from the engineering side ? If this were so, we venture to state that the Annual Conventions would be of more value and importance than they are at present. Viewing the paper on the whole, it may answer some useful purpose, if only to serve as an object lesson in how *not* to deal with the subject.

Discussion.

The discussion on this paper was opened by Mr. Robt. Hammond, who had apparently come to the conclusion that it was not practically possible to follow the author's precepts, even if desirable, for he remarked on the difficulty of putting by both for depreciation and other things, especially in a new industry. Furthermore, if greatly improved plant were obtainable, it would pay to scrap the old plant and install the new. He disagreed with those London authorities who were paying off loans on a 42 years' basis, and yet placed nothing to depreciation; in such cases the sinking fund should be supplemented so as to redeem the loans in 25 years. He believed in the soundness of dividing loans up according to the purposes for which they were applied, and urged that properly applied sinking funds would largely obviate the necessity for separate depreciation funds.

Mr. LEONARD ANDREWS agreed with the author as to the wisdom of providing a reserve fund, which could be used in purchasing new plant when necessary. It would be unwise to make depreciation compulsory, as it would often entail subsidies from the rates, and prices might have to be increased.

BAILIE STEVENSON referred to the satisfactory state of Edinburgh finances, putting in a plea for sound finance. He believed in having both reserve and depreciation funds—but not in disposable "profits" which might benefit the general ratepayer at the cost of the electrical consumer.

Mr. W. W. LACKIE, advocated paying for all repairs to plant out of revenue, writing off capital the estimated depreciation each year, and charging renewals to the capital account. He further advocated the creation of suspense funds for the gradual paying off of heavy items of expenditure, such as was incurred in Glasgow by the change-over in supply pressure. In his opinion, appreciation had to be placed against depreciation; nearly all concerns were saleable at good figures.

Alderman PEARSON remarked that so long as you had the money to replace things it did not matter what form it appeared in. It was necessary to provide another fund to draw from for renewals, in addition to the sinking fund. He referred at some length to the relative position of the companies and municipalities in this matter, and to the divergence of opinion which existed as to exactly what depreciation should be allowed. He did not believe in entirely relieving the coming generation of responsibility in regard to the plant when it came into their possession.

Mr. YEAMAN, in replying, pointed out that all he wanted was some other fund, which could be drawn from if necessary, in addition to the sinking fund, which obviously could not be drawn from. If it were possible to pay out of revenue the depreciation in value of plant which was being scrapped, in any one year, then the undertaking was too wealthy, and was charging its consumers unduly; while if the same course were followed, with normal revenue, a bad result for the year would appear. He concluded by urging the necessity of accumulating some fund for withdrawal purposes, if sound finance was to be ensured.

DISCUSSION.

A desultory discussion followed the reading of this paper.

Mr. GEORGE WILKINSON (Harrogate) referred to the success attending his method of supplying tested lamps in Harrogate.

Prof. E. H. CRAPPER testified to the value of a lamp which came up to its marked value, Mr. A. J. Cridge (Sheffield) and Mr. Robt. Hammond both criticised the wide limits of candle power in the Harrogate specification, and Mr. F. Ayton (Ipswich) remarked on the advantage of photometric measurements in the case of shaded lights, which were apt to deceive the consumer as to their true value.

Mr. HAYDN HARRISON said the most interesting point was the degree of accuracy to be aimed at in testing for the consumer, as with a 10 per cent. limit many more lamps could be tested at less cost. He thought people were beginning to doubt the accuracy of photometric tests, as being dependent on the vision, but he reminded his hearers that most measurements were similarly dependent in some degree on the vision. He considered that the flicker head, in which it was only a case of eliminating the flicker, and not a case of balancing, as with the grease spot, was by far the most accurate in a general way.

Mr. C. FURNESS (Blackpool) startled the meeting by a recital of drastic measures employed in Blackpool, where any 16-C.P. lamps testing over 5½ watts or giving less than 10 C.P. were smashed and not returned to the maker. Very few of his consumers availed themselves of the testing facilities offered by his department. He considered that it really rested with the consumer what standard of light he should use, the engineer's business was to supply energy.

Mr. MCCOURT, in reply, pointed out that the limits of candle-power adopted at Harrogate were the same as adopted by the Engineering Standards Committee. As a result of tests of Osram lamps, he came to the conclusion that some sort of specification would be necessary for metallic filament lamps. In Harrogate they used moral suasion with the local contractor, who agreed to supply only tested lamps to the consumers.

Photometry in Central Stations.

The paper on "Photometry," read by Mr. Robert McCourt, was the means of gaining for him the Association's Travelling Studentship; it was the only one submitted with that object, but was regarded by the Council as so good that it deserved the reward. The author rightly emphasied the importance of giving more attention to the subject of photometry than it had received in the past, especially in view of the increasing severity of competition; and the fact that the advocates of incandescent gas lighting invariably base their arguments on the initial candle-power of the mantles, which falls off so rapidly after a short period of use, renders it necessary to be able to take measurements of the candle-power of lamps *in situ*. The author briefly summarises the fundamental principles of photometry, and passes on to describe the system in use at Harrogate, where, under Mr. G. Wilkinson, the testing of glow lamps has been developed to such an extent that now from 20,000 to 30,000 lamps pass through the department per annum.

The lamps are first tested for watts consumed at normal voltage, those falling beyond specified limits being rejected; 200 lamps can easily be tested per hour. Next, the candle-power is measured, a Bunsen photometer head being used, with a scale reading direct in candle-power. The lamp under test is rotated at 200 R.P.M., and the pressure is maintained accurately at the normal value. This test is performed at the rate of 150 lamps per hour. Lamps which pass the tests satisfactorily are marked on the glass bulb with etching fluid. The limits prescribed are as follows:—

	100 volts.		200 volts.		
	Total watts.	Watts per C.P.	Total watts.	Watts per C.P.	Limits of C.P.
5 C.P. ...	26	4·2	28	4·5 from	4-6·5
8 C.P. ...	34	4·	36	4·25	7-9
16 C.P. ...	66	3·75	68	4	14-18
25 C.P. ...	100	3·75	108	4	22-28
32 C.P. ...	130	3·75	140	4	28-36

Since the introduction of the system in 1905, a marked improvement has taken place in the quality of the lamps submitted; in January, 1906, 85·7 per cent. passed the tests, while in January, 1907, 91·3 per cent. were certified. The paper concludes with a description of the Harrison portable photometer. While there is little novelty in the paper, it will, no doubt, be useful to engineers who contemplate the adoption of a system similar to that which has proved so successful at Harrogate.

Alternating-Current Distribution.

Considering the highly technical character of the audience, it is somewhat surprising that Mr. A. J. Cridge should have thought it necessary to devote one-third of his paper to the elementary theory of alternating currents. Perhaps—dread thought!—the author *doubted* the highly technical abilities of his hearers; certainly colour is given to this suggestion by the apologetic paragraph at the end of his paper, in which he says, "As a rule, central station engineers have not the time to investigate these matters at first hand, and the theoretical knowledge gained through a technical college training is apt to become very rusty when exposed to the variable weather of practical experience." If that be so, so much the worse for the undertakings in their charge—not that we endorse the implication.

Coming to the gist of the paper, it appears that there are 831 electric A.C. motors, of 7,000 H.P., connected to the Sheffield Corporation's mains, and consequently the power factor at times falls to a low value, loading the generators and mains with a large idle current. In fact, the power factor is often even lower than 0·707, at which value the idle current becomes equal to the useful current. In the evening, when the lighting load comes on, there is, of course, a marked improvement, the power factor rising to over 0·9. To remedy this trouble, it has been decided to install a synchronous motor in the old generating station at Sheaf Street, and to run it light with over-excited fields, the machine then acting as a condenser supplying the idle current on the spot, and relieving the mains and generators. The motor will be of 600 kilovolt-amperes capacity, and will cost about £800; the consumption of energy to run it will be some 32 units per hour, costing, at ¼d. per unit, and 15 hours a day for 300 days in the year, £150 per annum. Adding capital charges the total cost will not exceed £200 a year, while the capital charges *alone* on the mains and generators set free, will be £300. Apart from theoretical considerations, a turbo-generator at Sheaf Street has been experimentally run as a motor with over-excited fields, and the results were found to warrant the course indicated above. The author makes no claim for novelty on behalf of the system, which has been a common-place of alternating-current theory since the earliest days, and has frequently been applied in practice. Incidentally, he mentions that a 120-H.P. motor driving a D.C. generator, which is normally loaded to not more than 40 H.P., has been run for some time with 50 volts on the A.C. side instead of 200 volts, the normal pressure, with a marked reduction in the consumption of energy as the result, the power factor also being raised from 0·35 to 0·9.

DISCUSSION.

Mr. F. LANGLEY (Sheffield) thought the method proposed would be even more efficient than Mr. Cridge had shown, as cable losses would be diminished. A synchronous motor with some fly-wheel effect, would take up sudden variations in load and steady the lighting.

Mr. C. H. YEAMAN (Hanley) suggested that discarded alternators might be fitted with fly-wheels, and adopted for supplying wattless currents; this would save special expenditure on plant for the purpose.

Mr. C. TURNBULL (Tynemouth) thought the comparatively low pressures at Sheffield resulted in a proportionately large idle current; he further suggested that, as change of speed was necessary for fly-wheel effect to be felt, the advantage of fitting fly-wheels to synchronous motors running with constant periodicity was not apparent.

Mr. S. L. PEARCE (Manchester) said that the question of dealing with low power factors such as obtained in the works of large consumers, would have to be considered in Manchester. The lowest power factor recorded with him in such a works was ·7, and it was easily compensated for by over-exciting the synchronous motor-generators in the sub-station. He hoped that it would soon be possible to obtain static condensers for use with step-up transformers.

Mr. R. MCCOURT, Mr. W. J. SOWTER (Bray) and Mr. A. A. DAY (Bolton) also spoke; Mr. CRIDGE, in reply, pointed out that their decision to install a 600 or 700-KW. machine, as indicated in the paper, was the outcome of successful experiments, and the PRESIDENT (Mr. Fedden) referred to the possibility of getting a bad leading current by putting in too many synchronous motors.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

The Statter Time Lag Relay.

The SWITCHGEAR CO., LTD., of Newhall Street, Birmingham, recently issued a new leaflet (No. 30) dealing with this Patent Time Lag Relay. The latest form of this device is illustrated in the accompanying figure. It is a new arrangement of Statter's Patent Time Lag and is convenient for the application of the inverse time element principle to existing motor starters, A.C. switches and the like. As illustrated, it is arranged to act on the no-load magnet of a starter, and the connections are merely electrical ones which can be made quickly by any competent wireman. The relay is also made to couple by electrical connections only to the trip coils of either circuit breakers or oil switches; the connections recommended are similar to those for the induction relay. In this case the trip coil is normally short-circuited and the short removed by the relay, in contradistinction to the D C. method of operating a motor starter where the magnet included in the shunt circuit of the machine is normally energised, but is short-circuited, and de-energised by the relay at the moment of its action.

The action of this relay in short-circuiting the no-load coil is claimed to be positive and definite, and to do away with the trouble that has been experienced with the overload arrangement as applied to starters. For the satisfactory application of the inverse time limit principle to all circuit-breaking devices, modern practice demands two styles of curve, both of which the Switchgear Co. can give: (*a*) a relay with the inverse time limit principle acting throughout a limited range and afterwards opening instantaneously; (*b*) a relay with the inverse time limit principle acting throughout its whole range.

The first-mentioned pattern of Statter's Time Lag is suitable for motor protection. Here the persistence of an overload equal to three or four times the normal load of the motor would do damage to the commutator and brushes; at this point, therefore, the relay to protect the motor fully must act instantly.

For a central station network controlled by circuit-breakers or oil switches, such a relay would be useless. Here overloads exceeding ten times the value of the normal load may at times surge through the cables, and it is at this moment that discriminating action is needed. The second type of relay must, therefore, have a curve which becomes a symptotic to a line representing a small interval of time on overloads of the greatest magnitude. The first pattern of the lag as a direct attachment to circuit breakers has been supplied to the Admiralty for several of their dockyards, and is also being supplied for industrial purposes generally. The second pattern is now being introduced to central station engineers for mains protection.

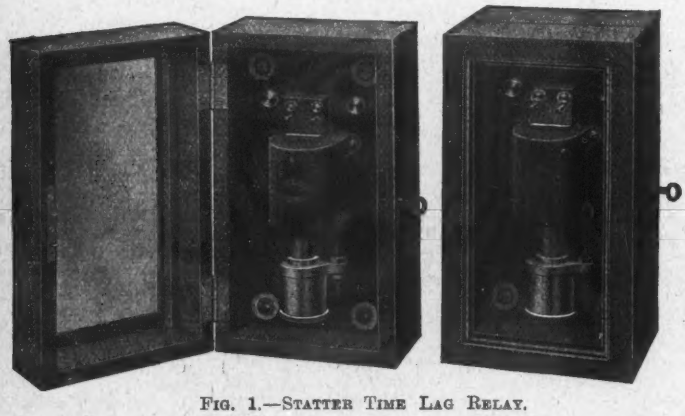


FIG. 1.—STATTER TIME LAG RELAY.

New Recording Voltmeter.

Messrs. J. W. & C. J. PHILLIPS, of 23, College Hill, E.C. (the Bristol Co.), have lately introduced in this country a new recording voltmeter for both direct and alternating current. The recording voltmeters manufactured by the Bristol Co. have been extensively adopted, but up to the present it has been necessary to furnish the instruments with entirely different current coils, according as they were to be employed upon A.C. or D.C. circuits. In many electric plants both alternating and direct currents are generated, and if the same voltmeter can be used equally well for recording either kind of current, a valuable advance has been made.

This has been accomplished in a special portable form of the instrument, shown in the accompanying illustration (fig. 3). The case is provided with a handle and levelling screws for convenient transportation and adjustment. The door is open, showing the construction and manner of operation. The novel features and improvements claimed for this instrument are that it is equally applicable to both alternating and direct current; that it requires only one-third as much current to operate circuits as it was necessary for the older design for alternating currents; that it is more sensitive to very slight variations of voltage; that the chart graduations are nearly uniform on both sides of the working range; and that the portable form of the instrument in its carrying case is only half the size and weight formerly required.

The solenoids shown in the illustration are so connected, that when current is passing through them in series, the movable solenoid will be repelled from, instead of being attracted toward, the stationary one. The movable solenoid is mounted on a frictionless knife-edge multiplying device, which transmits its motion to the pen arm, carried by the knife-edge blade. This simple multiplying device permits the solenoids to be located very near each other, and consequently the magnetic field is uniform throughout the motion of the solenoid, resulting in the desirable scale divisions of the chart. By making the construction of the solenoids so that there is repulsion instead of attraction, the mutual inductance between them is neutralised, thus making the same instrument suitable for recording either alternating or direct current. The instrument is independent of the rate of alternations, and is compensated for changes of atmospheric temperature.

FIG. 2.—"SIMPLEX" SPRING CLIP.

Surface Wiring in Damp Situations.

It is bad practice to erect conduits and fittings in direct contact with damp walls, such as in boiler-houses, laundries and other situations where steam is constantly present, as a large amount of condensation takes place and moisture runs down the face of the walls, so that the conduits are continually subjected to the drip. This is not only detrimental to the exterior surface of conduits, but also causes undue condensation inside.

The best method of obviating this is to fix conduits some distance away from the wall itself, and hitherto although this has been practicable it has been a matter of considerable difficulty. With the new spring clip (fig. 2) introduced by SIMPLEX CONDUITS, LTD., it can be easily accomplished without adding materially to the cost of the job.

These clips are manufactured from a stout steel strip of springy nature, and are drilled in the base with a ¼" hole to take a screw, and the tips are also provided with holes to take a split pin, thus preventing all possibility of the conduit slipping out after erection.

Simplex wall fasteners can claim an advantage as regards labour over the ordinary method of plugging walls. They are

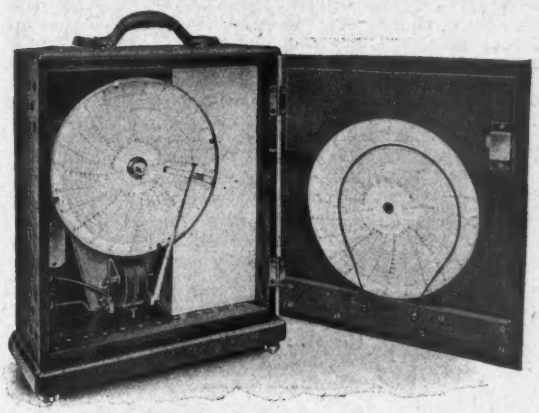


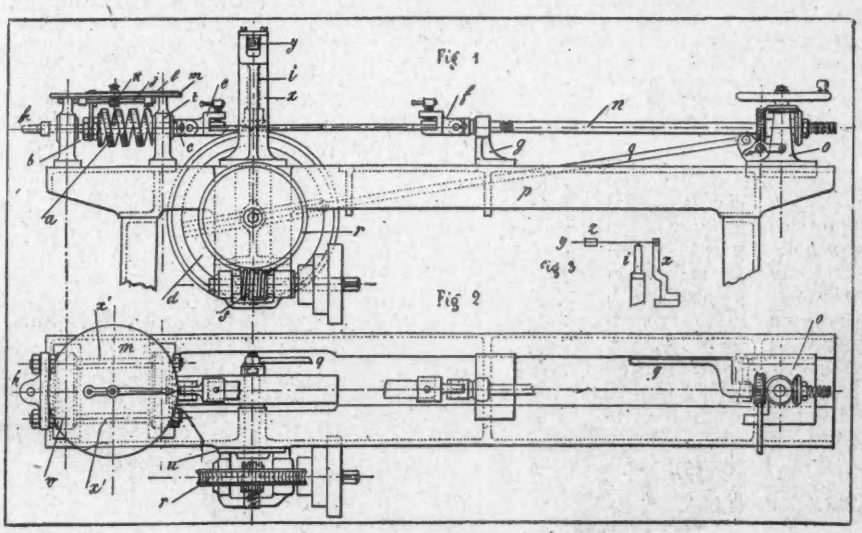
Fig. 3.—New Bristol Recording Voltmeter.

made of hardened steel and will not fracture when driving into cement-faced, brick or patent fire-proof walls.

Dynamometer for Testing Rubber, &c.

A convenient form of dynamometer, suitable for testing rubber, wires, fabrics, paper, &c., has been patented by Messrs. A.-D. Cillard Fils, of Paris and 6, Holborn Viaduct, E.C.

As shown in the accompanying illustrations (fig. 4), it consists of a cast-iron table provided with a horizontal spring balance, which carries one of the jaws to hold the test-piece. Means are provided to recalibrate the spring, and the pointer is arranged so as to remain at the maximum indication on the breakage of a specimen, thus recording the breaking load. The load is applied either with a



a, steel spring; *m*, dial; *l*, pointer; *e*, jaw attached to spring; *f*, movable jaw; *n*, screw; *o*, *g*, headstocks; *q*, eccentric rod.

Fig. 4.—Dynamometer for Testing Rubber.

hand-wheel and bevel-gear for quick motion, or through worm-gear for heavy loads at low speed, and pulsating stresses of any desired amplitude can be applied by means of an eccentric gear, at adjustable speeds. Samples can be tested in a bath, by means of which the temperature can be varied; and the apparatus also provides for compression, plasticity, repeated bending, wear and friction tests, so that it is capable of being applied to a large number of purposes.

GRAPHITE LUBRICATION.

Indications are that the field of lubrication is about to be revolutionised by what is known as the "Acheson Effect" in the treatment of graphite. It has long been known that graphite is a very good lubricating body, and many have endeavoured to suspend it in a liquid in order that it may more efficiently and thoroughly enter the field of lubrication. Up to this time all such efforts have failed, but Mr. E. G. Acheson, the discoverer of the process for making artificial or manufactured graphite, as well as carborundum, has invented a process whereby his unctuous graphite remains permanently and thoroughly suspended, not only in oil, but also in water, in which form it may take the place of oil for many classes of lubrication.

Last year Mr. Acheson discovered a mode of producing a fine, pure unctuous graphite, and endeavoured to utilise it as a lubricant. He found that in the dry form, mixed with oil or grease, it was easy to handle, but in his efforts to suspend it in oil, he met the same troubles as were encountered by his predecessors in this line of work. The graphite would quickly settle out of the oil, which told him that his unctuous graphite was similar to the natural product and obeyed the same laws.

In 1901 Mr. Acheson had engaged in a series of experiments having as their object the production of crucibles from artificial graphite, and had made several experiments on clay with vegetable extracts. Tannin was one of the articles used, and he found that a moderately plastic, weak clay, when treated with a dilute solution of gallotannic acid or extract of straw, was increased in plasticity.

It was in the latter part of 1906 that Mr. Acheson realised that possibly tannin might have the same effect on graphite that it had on clay. When he tried it, the results were satisfactory. Experiments made with unctuous graphite of Mr. Acheson's manufacture, which might properly be termed disintegrated unctuous graphite, have been most interesting. One of these experiments was as follows:—

To one sample of this graphite plain water was added, and after rubbing it in a mortar it was poured into a test tube. To another sample of the graphite and water a little gallotannic acid was added, also a few drops of ammonia, the latter not being absolutely necessary, but having been found to improve the result with some waters. This second mixture was rubbed in a mortar, as in the first case, and then it was poured into a second test tube. Both tubes and their contents were thoroughly shaken and simultaneously placed in a rack to settle. When about two minutes had elapsed after the shaking, it was found that the graphite in the plain water had completely separated from the water, not being miscible therewith, while the mixture of water, graphite, tannin and ammonia remained as black as when originally shaken up. The graphite was thoroughly suspended, and showed no disposition to settle or separate.

Next, from a bottle containing a quantity of graphite, water, tannin and ammonia, which had been mixed some weeks, a quantity was poured into a glass funnel containing one of the finest filter papers made in America. The deflocculated graphite ran through the fine filter paper and collected as black as ever in the tube below, apparently unchanged. Its passage through the paper was remarkably rapid, leaving no doubt that it was thoroughly mixed.

Mr. Acheson has obtained this "effect" with amorphous bodies generally, such as alumina, lampblack, clay, graphite and siloxicon, the only exception being magnesia, which needs further tests.

In its deflocculated condition, as produced by Mr. Acheson, graphite has a condition of fineness far beyond that attainable by mechanical means. The "Acheson Effect" not only makes it possible to cause graphite to remain suspended in water for an indefinite period of time, but also gives it the further advantage of preventing rust or corrosion while associated with water.

After he had succeeded in deflocculating graphite, and causing it to remain suspended in water, Mr. Acheson turned his attention to the problem of replacing the water with petroleum. The desired result was eventually accomplished. The writer has witnessed the suspension of deflocculated graphite in water, has seen the water removed, and the deflocculated graphite suspended in oil and passed through the finest filter paper, the graphite remaining suspended thereafter.

Having accomplished these results, Mr. Acheson feels assured that he can meet any demand for a lubricant where oil is preferable and evaporation of his water lubricant might be objectionable. It should be understood in this connection that the very lightest and thinnest of oils, in conjunction with deflocculated graphite, can be used in the place of the heavy and expensive lubricating oils of the present day, while the lasting qualities of these graphite lubricants will be greater than those of the oil lubricants heretofore used.

There is no end to the possible application of the deflocculated graphite as a lubricant with oil or water, and its cheapness will make it a powerful competitor of oil lubricants. Mr. Acheson gave carborundum to the world, and it is remarkable that experiments along the same lines should have resulted in this new lubricant in its varied forms, for carborundum is the hardest known abrasive, while graphite will take the place of oil.

Thetford Lighting.—The T.C. has requested Messrs. C. Burrell and Sons to quote terms for lighting the town by electricity.

CORRESPONDENCE.

Letters received by us after **5 p.m. on Tuesday** *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Vacuum Tube Lighting.

Seeing in this week's issue an extract from an American contemporary regarding the Moore vacuum tube light reminds me that in the *Illuminating Engineer* (New York) for May, there appears the following paragraph :—

"On April 29th the Moore Electrical Co., of Newark, New Jersey, sent, *viâ* the Hamburg-American liner *Deutschland*, two men and apparatus for two installations of the Moore light in the largest automobile garage in Europe, located in London. This is especially interesting, because it is the first foreign installation of the Moore light."

So far as I am aware no note of this has appeared in any of the electrical Press, which is a matter for regret to many poor benighted "provincials" like myself, who look for light and leading to the Metropolis.

It may be of interest to mention that when preparing my paper on "Illumination" for the Glasgow Local Section of the I.E.E., I was in communication with the Moore Electrical Co., and was informed under date, February 9th, that they were not then quite ready to ship any apparatus abroad. Since then, however, Mr. Moore, on April 26th, read a paper to the American Inst.E.E. giving all details of his apparatus.

It will be interesting to learn how the system will work in this country.

John D. Mackenzie.

Glasgow, *July 5th*, 1907.

Bankruptcy Proceedings.—Edgar Peckham.

The directors of the Malleable Steel Castings Co. (1906), Ltd., have had their attention called to a report in your issue of June 28th last, of the public examination of one Edgar Peckham, from which it appears that he stated that he attributed his insolvency partly to the non-success of the said company. It is obvious that such a statement is calculated to do the company considerable injury, and I am instructed to emphatically deny the insinuation that the company is not a success, and to ask you to give the same publicity to this denial as you have given to the report.

The company is in a perfectly satisfactory condition, and my directors resent very much that this statement should be made, and especially that it should be made behind the protection of the witness box in legal proceedings.

The Malleable Steel Castings Co. (1906), Ltd.
A. E. Draper, *Secretary.*

Pendleton, Manchester,
July 4th, 1907.

Halifax and the Cost of Energy.

It has been apparent to me for some considerable time now that there is a want of uniformity in arriving at the cost per unit of electricity generated for tramway purposes.

Mr. Spencer complains in your issue of 28th ult., page 1,047, that if Halifax could purchase on such advantageous terms, the trams would show a handsome profit. Mr. Spencer gives examples as follows :—Leeds, ·76d., Bradford, 1·14d., Huddersfield, ·68d., Leicester, ·60d.

Looking through the Leeds accounts I find that the amount charged against power for depreciation and renewal = 1·03 per cent., which, on the face of it, is not a correct charge.

A 5 per cent. rate, which a careful examination of all the factors determines, would add ·242d. to the Leeds figure of ·76 bringing the cost per unit to 1·011d. which is more like the thing. Bradford buys its current, so we shall look at Huddersfield.

The depreciation and renewal figure here is a little more reasonable, though 3 per cent.—their figure—is hardly dequate ; 5 per cent., however, would not add greatly to he cost per unit.

The sinking fund charge, however, is astray. It only equals ·186 per cent. on the capital expenditure. It is clear this is wrong. The maximum period allowed for repayment of loans raised under the Municipal Corporation Act, 1882, is 30 years, and under the Public Health Act, 1875, 60 years.

A 2 per cent. sinking fund accumulated at 2½ per cent. interest will liquidate a debt in 33 years. Therefore, ·186 per cent. is impossible. Otherwise, Huddersfield is not so bad, and Mr. Spencer can almost rely on ·68d. if he likes.

An examination of the Leicester tramway accounts reveals the painful fact that, while £5,247 19s. 4d. has been charged against power for interest and sinking fund, there is nothing for depreciation. As the interest and sinking fund equal 5½ per cent. on capital, it would be simple justice to add this rate for depreciation. The unit would then cost ·81d. instead of ·60d.

Mr. Spencer does not quote any other towns in your note.

J. W.

Making Calcium Carbide in Ireland.

As managing director of three large carbide of calcium factories which are utilising many thousands of horse-power, you will perhaps allow me to ask Mr. Antrobus, whose letter appears in your number of June 21st, how he proposes to make carbide in this country at £5 per ton.

Mr. Antrobus showed me some time back some of the water powers he had in view, but they were utterly out of the question for the commercial manufacture of carbide of calcium, or of any other electrochemical on a decent scale.

Mr. Antrobus has had, I believe, absolutely no experience whatever in the manufacture of carbide of calcium, but if he can show us a spot in England where it can be manufactured at even 50 per cent. more than his figure, we should be very glad to assist in the undertaking.

With lime at 12s. per ton and water-power at £1 per H.P.-year, Mr. Antrobus will have some difficulty in making carbide at anything like £5 per ton.

As regards your remarks that there are large water powers available in Ireland, I have personally investigated the chief water powers there, but the power available is so irregular, owing to the small extent of their drainage area, that they have little chance of competing with Norwegian and Italian water powers, pending the arrival of Fiscal Reform.

As far as my experience goes, there is no electrochemical industry which can be carried on profitably with so small a power as 100 E.H.P. ; that is, if we consider that by this expression is meant the production of electrochemicals proper.

Chas. Bingham.

London, E.C., *July 2nd*, 1907.

Improved Nernst Lamps.

With regard to the correspondence in your columns some time back, it will no doubt interest your readers to know that we have, during the past, been collecting statistics relating to cause of premature failure of Nernst burners, and we are indebted to many central station engineers who have given the installation and maintenance of Nernst lamps their personal supervision. The results showed the necessity of improving the heater circuit which generally failed, and in some cases caused breakage of filament. Unfortunately we are unable to dispense with the heater circuit, but have arranged that this circuit is perfectly controlled by improving the insulation and design of cut-out coils, which we are fitting free to all Nernst lamps of which we have a record.

Since April 1st we have refitted 22,700 Nernst lamps in different parts of the country with these improved coils. Of the old coils returned to us about 60 per cent. were entirely burnt out and burners failed in consequence. We regret also that upon inspection of a number of installations of Nernst lamps used for street lighting, &c., we found that polarity had not been strictly observed. In fact the only town which our expert visited and found every lamp inspected on correct polarity, was Northampton, where the following lamps are maintained by the Electric Light Co. for a fixed charge per annum : 80 ¼-amp., 29 ½-amp., 83 1-amp., total 192 Nernst lamps. The average number of renewals

used from June 1st, 1906, to May 31st, 1907, for the above installation of 192 lamps was 338, that is only 2½ burners per lamp per annum. These results are easily obtained if improved cut-outs and suitable burners are used, and if polarity is strictly observed.

In conclusion, we would ask electrical engineers and contractors to communicate with us and return all Nernst bodies, so that we can fit improved type cut-out coils free of cost.

Pamphlets, giving full information as to how polarity shows on different type burners, will be forwarded on application.

The A.E G. English Manufacturing Co., Ltd.,
C. Pfeffer, *Manager.*

London, W.C., *July 8th*, 1907.

The Literary Engineer.

If I am not trespassing on your space, I should like to apologise to Mr. Elliot for spelling his name wrongly. I know how it feels to have one's name spelt wrongly, though I have not often to suffer from it. The number of the Review in which his letter appeared was mislaid when I dictated my letter, and I had to depend upon my memory. I am afraid also that I did not understand that his letter was intended to be humorous.

I should like to join issue also with "W. J. H." I think he is tilting at windmills. The practical man he refers to has long ceased to exist, except in the ranks of purely working men, men who work with their hands only. The modern engineer is quite a different man to the engineer of, say, 30 years ago. The engineers who have made engineering history are cultured men, with very rare exceptions, in the best and fullest sense of the term. The necessities of an engineering education may have debarred them from obtaining a deep knowledge of the ancient classics, but I should like to remind "W. J. H." that ancient Latin and Greek are not the only classics, and that English, French and German classics have quite as great an influence for culture as Latin and Greek. I venture to think it probable that the men I refer to, who are necessarily busy men, will hardly have had the time to read the obscure classics, but again I should like to remind him that only a small proportion of classical modern writers write as obscurely as Browning.

If "W. J. H." imagines that the modern engineer worships rule of thumb, except occasionally, where time may be saved, he is very much off the track.

On the other hand, I maintain that a pedantic stickling for grammar very often does hide a crass ignorance of the subject the pedant is writing about. It is the equivalent of the very ancient method of drawing a red herring across the scent.

Sydney F. Walker.

Bath, *July 8th*, 1907.

Trade Directories.

In an editorial article the *Electrical Contractor* for July, following up a preliminary article in the June issue, attacks the electrical trade directories—"the red, white and blue books"—with unsparing ferocity. The writer is familiar with the first and last of these, but is at a loss to identify the "white" book; but this by-the-way. The editor on the war-path magnanimously admits that so far as the supplying of addresses to known names is concerned, the existing directories are successful; where he finds fault is in the provision of lists of names in each sub-section of a trade, to assist the seller to circularise, and of lists of the *genuine makers or suppliers* of articles, for the use of buyers.

Those who know how directories are compiled will at once recognise that the function which is successfully performed is that for which the publishers are directly responsible; the other two are entirely in the hands of the members of the trade concerned. I have before me a circular recently received from the publishers of a well-known directory, giving nearly 500 headings; if manufacturers and contractors cannot find amongst these the headings under which their names ought to appear, surely it is not the fault of the publishers! Are the latter to dictate to the former as to their proper designations?

The directories, presumably, are not published for purposes of philanthropy alone, and therefore a small charge is made for each entry after the first; but that this consideration is not the cause of the frequent absences of names from a section to which they are well known to belong is clear from the fact that they so frequently appear in sections to which their claims are more than doubtful. If people will insist on describing their own businesses wrongly, the blame is theirs. The writer feels strongly on this subject, having frequently had to waste time in searching for the names of manufacturers, &c., of specified articles, and finding only the names of importers, of agents, and of people who had nothing at all to do with the articles in question. But he does not fly around and make furious onslaughts on the publishers, who are not responsible for the trouble.

As for the numerous examples of absurdities given in the last paragraph of the editorial in question, as a matter of interest the writer has inquired into them, and finds that not one of them is derived from the directory he uses—the "red" book (Berly's Universal Electrical Directory); they must, therefore, come from some other directory, and it is decidedly unfair on the part of the editor thus to attack all for the faults of one. He winds up with "the list of 'Wiring Contractors,' about which we do know something," and apparently he finds this the head and front of offence; well, anyhow, the "red" book contains the names of *all* the members of his society (the Electrical Contractors' Association)—if he is not satisfied with that, what does he want? Does he mean that a list of those contractors who belong to his society, and a good many more, is absurdly inadequate as a list of wiring contractors?

Red and Blue.

July 8th, 1907.

"Bronskol" Metal Brushes.—A correspondent asks the maker's name.

LEGAL.

Troup, Curtis & Co. *v.* West Ham Guardians.

Before his Honour Judge Smyly, in the Bow County Court on Friday, Messrs. Troup, Curtis & Co., manufacturers, of Victoria Dock Road, E., sought to recover £9 12s. 2d. from the West Ham Board of Guardians for work done and goods supplied.

Mr. Atkins, for the plaintiffs, said the claim was for the supply of three standard lamps at a cost of three guineas each, and the balance of 3s. 2d. was due on an old account.

Mr. Lynch, who appeared for the guardians, said their defence was that the charges were excessive.

Mr. Troup, a member of the plaintiff firm, said that in September last he tendered to the defendants for the supply of certain goods, and received an order for three vertical Preston lamps. He sent them, but they were returned, and someone told him on the telephone that the lamps were not exactly what was wanted. Knowing "the notorious position" the West Ham Guardians were in at that time, he thought it best to go and see them on the matter. He called and saw Mr. Jackson, the chief engineer, who explained exactly what he wanted, and witness then supplied three standard lamps for nine guineas.

Mr. Atkins: Do you think that a fair charge?—Yes, I thought it best to make my charges low because I was told that every contractor was being treated as a rogue. With regard to the balance of the claim, 3s. 2d., witness said he arranged to supply defendants with goods made by the General Electric Co., Ltd., at a discount of 25 per cent. off the listed prices. The company, however, put up their prices 10 per cent., so he sent in a bill for £3 15s. 2d. instead of £3 12s. Defendants reduced it to the latter amount, and would not pay the extra 3s. 2d.

Mr. Lynch: It was not the list prices which went up; it was your discount with the firm which went down 10 per cent.?—Yes.

Do you mean to say that if your discount had been increased you would have given the guardians more than 25 per cent.?—Yes. Further questioned witness said he did not alter the Preston lamps; he had to make special fittings. The lamps were worth what he charged, and could not be made for something like 18s. The charge for labour alone was £6 0s. 1d.

Was there anything unusual in making these lamps?—Yes, it was unusual to us. We are not lamp makers.

If you like to make unusual things, do you think the Guardians should pay for them?—Yes, sir.

Mr. Ward, called for the defence, said he was electrical engineer to the Guardians. The lamps had never been used. The price of three guineas for each lamp was excessive. He thought it would

take a man 15 hours to make a lamp, and the cost of his labour would be 11s. 9d. Cross-examined, witness admitted that he had never made a lamp anything like that.

Harry Owen, estimating clerk to a firm of ironmongers and contractors, said in his estimate to the Guardians, he offered to make the lamps at 18s. each.

George Acres, of a firm of builders merchants, said he had estimated for the supply of the three lamps at 15s. each. The price of three guineas was ridiculous.

His Honour said there was such a difference between the parties that he would defer his judgment to see what he could ascertain about the cost of the articles.

Smoke Nuisance Prosecution.

The Underground Electric Railways Co., of London, was summoned at Westminster last week for smoke nuisance at Lot's Road generating station. The Chelsea Borough Council, who prosecuted, said that they did not wish to do anything vexatious, but they felt that they were bound to take action after continuous complaints about a nuisance which had become a scandal and which was injurious to health. The station supplied many railways with current, and it would no doubt be contended that under statutory powers the company had authority to carry on their business as they were doing. His point would be that no private Act could override, remove, or modify a public statute.

Mr. J. R. Chapman, chief engineer of the company, explained that the power house at Chelsea contained 64 boilers and 128 furnaces. 450 tons of coal were consumed daily. Each of the four chimneys was 19 ft. in diameter. Anyone who said the smoke was black was colour-blind. Witness produced negatives and photographs taken during the last day or two showing the smoke from the Greenwich station of the L.C.C. He was prepared to admit that occasionally brown smoke emanated from the chimneys.

The proceedings were adjourned.

Lea *v.* Bailey & Co.

At the Accrington County Court on Friday, July 5th, William Lea, a machinery agent of Liverpool and Manchester, was sued by Messrs. Bailey & Co., electrical engineers, of Accrington, for £38 odd for breach of contract. The case for the plaintiffs was that defendants had failed to deliver, in time to be any use, an engine to drive a dynamo for lighting a volunteer camp in Buckingham. Messrs. Bailey declared that they had lost a contract of a similar nature because the work at Buckingham could not be carried out in a satisfactory manner, due to the engine not being delivered as agreed.

It was urged in defence that the order had been revived, and that the contract was duly carried out.

In pronouncing a verdict for the defendant firm, Judge Hans Hamilton remarked that the plaintiffs had his sympathy, but the law was against them.

London Electron Works, Ltd., *v.* Wagner.

In the King's Bench Division on Saturday, July 6th, before Mr. Justice Phillimore, judgment was entered, in default of defence, for plaintiffs in this case, in which plaintiffs, the employers of defendant, sought an injunction restraining defendant from disclosing trade information, and from carrying on business himself within a certain time of the termination of his engagement. The injunction was granted, with costs.

Lynch *v.* Macartney, McElroy & Co.

The Master of the Rolls, Sir Gorell Barnes, and Lord Justice Kennedy on Tuesday heard the application of the defendants in this case for judgment or a new trial on appeal from verdict and judgment at trial before Mr. Justice Bigham and a common jury. The hearing of the action has already been reported (see Electrical Review, April 26th and May 3rd).

Mr. Hugh Fraser, for the appellants, contended that the words complained of could not reasonably be construed as containing an imputation upon the plaintiff. There was no ill feeling between the parties, and their relations were perfectly friendly. The plaintiff was not even cross-examined on the question of spite or anything of that kind. Mr. McCall, in opening the case for the plaintiff, had made statements which were not substantiated, and the jury were probably misled by them. One such statement was that the plaintiff had applied to the defendants for a reference, and that it was refused. The Judge recommended the jury to find small though not contemptuous damages if they thought the advertisement conveyed the impression that the plaintiffs' engagement had been determined in circumstances which were not creditable to him, and after the verdict he intimated that, in view of the smallness of the circulation of the paper and the fact that the plaintiff had suffered no direct pecuniary loss, the damages were too large, and that, if it had been left to him, he should have awarded £50.

Mr. Lush, K.C., also addressing the Court on behalf of the appellants, said Mr. Lynch had himself, in a letter to them, asked when he could be relieved of his duties, and all they had done was, without the least malice or ill-will, to use his own language. They might be liable for the incurious use of a phrase which might convey an injurious imputation, but the reason for the advertisement was that the defendants had lost £1,000 through natives in Malta foisting orders upon officials. They had no chance in the Malta Courts, and that was why the notice was published. The idea of attacking Mr. Lynch was not present to their mind at all.

Mr. M'Call, K.C., on behalf of the plaintiff, submitted that the verdict was right, and that the question of injurious imputation was solely one for them. With regard to the damages, he was prepared in the Court below to reduce them, with a view to ending the litigation, but the defendants did not consent.

Their Lordships reserved judgment.

Bland Bros. *v.* J. H. Graham, Ltd.

At the Newcastle-on-Tyne Assizes, on 6th inst., before Mr. Justice Grantham, an action was heard in which plaintiffs sued for balance of accounts upon four contracts for work done and materials supplied in connection with the electric lighting of the Turk's Head Hotel, Newcastle.

The claim was for £132, balance of account, for electric fittings put in the hotel by the plaintiffs. The defence was that the workmanship was defective, and that £99 had been spent by the defendants in putting right the work that ought to have been properly done by the plaintiffs, and the defendants held they were entitled to reduce the claim by that amount. They also counter-claimed for loss of business caused through the defective work.

Mr. Mundahl, for defendants, called evidence to prove defective workmanship on the part of the plaintiffs, and as to the amount necessary to put it in proper order.

Evidence was also called to show that there was nothing unworkmanlike in the way the contracts had been carried out.

In giving judgment, His Lordship held that the work had been done under many difficulties, and the plaintiffs ought not to be mulcted in damages where the deficiences arose through alterations required by the defendants. Considering that there had been no complaints for so long, he had great doubt whether he ought to make any deductions at all. £80 had been paid into Court, and there was £73 in dispute. As to a counter-claim for £65 for loss of custom by the defendants in consequence of defects, His Lordship ignored it altogether. He thought he would be doing full justice to the defendants if he allowed them £20 for work which had to be redone. Judgment was accordingly given for plaintiff for the amount claimed, less the £20.

Stealing Telegraph Wire.

W. Snowshall, aged 19, has been sentenced to 12 months' hard labour for stealing copper wire, which he had cut from Post Office Telegraph poles on the tow-path of the Grand Junction Canal at Acton. It was stated for the P.M.G. that in the last six months there had been 37 cases of telegraph wire cutting in that particular neighbourhood.

Frost *v.* London County Council.

Plaintiff, a law writer, sued defendants at Westminster County Court, claiming damages for assault. One of defendants' car conductors refused him admission to a car at New Cross, and pushed him off, causing bruises and shock. Evidence was given that he was, and also that he was not, drunk, but the jury awarded £50 damages and costs.

Townsend *v.* Swindon Corporation.

Mr. Justice Walton and a special jury had this case before them last week at the Western Circuit Assizes at Bristol. Plaintiff claimed damages from defendants in respect of serious injuries sustained by him on June 1st last year by the upsetting of one of the Corporation electric tramcars. He was by occupation managing director of a corn and seed business at Stroud, was 40 years of age, and had an income of £700 a year. He was still able to do a certain amount of work, but had ceased to be managing director, and the medical evidence went to show that his condition might possibly improve. The spinal cord was affected, also his sight. The jury gave a verdict of £8,000, and a stay of execution was granted for ten days.

United Motor Industries *v.* C. A. Vandervell & Co.

In the King's Bench Division on Monday, this action was commenced before Mr. Justice Walton and a special jury.

The plaintiffs, who are factors and dealers in motor accessories, of 45 and 46, Poland Street, and Castle Street, London, and also of Coventry, sued defendants, who are manufacturers of accumulators for electric motor-cars, of Warple Way, Acton Vale, London, W., for damages for breach of an expressed and implied agreement, and also sought an injunction restraining defendants from further violating the agreement. Defendants, whilst admitting the act which constituted the alleged breach, repudiated that the agreement was continued by implication and denied liability. The hearing was continued on Tuesday.

PARLIAMENTARY.

Aberdeen Electricity Bill.

The Bill promoted by the Aberdeen Corporation came before the House of Commons Select Committee, Major Seely presiding, on Monday.

Mr. H. Lloyd, K.C., in opening the case for the promoters, said that Kincardineshire had raised no objection to Nigg being included in the electricity supply area. The electricity works were commenced in 1890, and £277,000 had been spent on them, and last year the gross revenue was £42,000. The works had been financially a success; they supplied energy at a fair price, and £87,000 had been placed to depreciation and sinking fund account. The Corporation had a number of contracts with several large manufacturers in the district. The County Council objected to the Corporation invading the country, and they also were opposing the proposition to acquire the Cults Company. The Corporation proposed to supply the district along the Dee and the Don and they thought they could supply the two valleys cheaper and more easily than would separate undertakings. The Corporation wished to supply electricity at an economical price, and he thought the County Council had some idea of taking electricity from the Corporation in bulk, but that he considered would not be so economical, as it would mean a profit for the Corporation and a profit for the Council.

Mr. Kemp gave evidence in support of the Bill and said they had a reserve and sinking fund amounting to 31 per cent. of the capital outlay. They had reduced the price of electricity. Witness gave particulars as to various contracts they had hopes of securing.

Mr. Balfour Browne, K.C. (for the County Council), endeavoured to get Mr. Kemp to admit that they were more in favour of gas than electricity, but Witness said that from inquiries regarding electricity they considered that the supply created the demand.

Answering Mr. Browne, Mr. Kemp said that he was not aware that the Council had passed a resolution expressing their willingness to buy the Cult works, and the Corporation had not gone behind the backs of the Council as they (the Council) had notice of the provisional agreement from the company.

Re-examined by Mr. Lloyd, Witness said that every objection of the Council had been met and provided for in the Bill except one and that was they had not withdrawn the Bill. At a meeting of the Town Council 10 members voted against the Bill and 23 for pushing on with it.

Other witnesses having given evidence in support of the Bill, the Committee adjourned.

At the resumption of the Committee on Tuesday, Mr. James A. Bell, electrical and tramways engineer to the Corporation, gave evidence, and said that in 1900 a new generating station was erected. The works were fully equipped, and had a plant of 3,810 kw., and they could extend it to 12,000 kw. if necessary on the present site. There were about 30 miles of cables laid in the city, and 1,698 consumers connected to the mains, and they had 343 power consumers. At the end of 1906, the motors coupled to the mains were equivalent to 2,292 h.p., and there had been an addition of 926 h.p., or 40 per cent. increase during the present eight months of the financial year. The Corporation charged for private lighting 4·08d. per unit; motive power, 1·67d.; heating, 2·12d.; public lighting, 2·19d.; Corporation trams, 2·25d.; and suburban trams, 2·25d. per unit, or an average of 2·21d. per unit. The Aberdeen electrical undertaking ranked eighteenth in size out of the 207 municipal electrical undertakings, and there were only 22 undertakings which had lower total costs than the Corporation, at ·85d., although they were handicapped in being some distance away from coalfields. Only eight other undertakings had a lower works costs, which amounted in the Corporation's case to ·52d.

Cross-examined by Mr. Balfour Browne, Witness said he estimated the total amount required would be £53,010—£8,646 for cables, £10,649 on the Donside district, £24,816 for the Deeside district, and £17,745 for extensions at the Ferryhill station.

Mr. J. F. C. Snell said he had inspected the electricity station at Ferryhill, and was of opinion that it was a site upon which considerable additional plant could be erected. He had examined the accounts of the undertaking, and considered that the department was most sound.

Evidence was then given by a number of manufacturers and traders in the district who expressed their willingness to take a supply of electricity.

This closed the case for the promoters.

Mr. Murison, County Clerk, was then called on behalf of the County Council, and said that they considered that, as Parliament had created County and Town Councils, it was not meant that they should invade each other's areas. The County Council were pledged to buy the Cults undertaking if that Bill was rejected, and they considered that the undertaking was worth £4,000 or £4,500, and the price the Corporation were paying for it—£9,000—was too much. The County Council might, if it was economical, buy their supply from the Corporation, but they wished to have the option of generating or buying in bulk. They suggested that the Bill should be withrawn in order that some arrangement might be come to between the parties.

Mr. W. Westland, a member of the County Council, opposed the Bill, and said that, on the advice of experts, he believed they could supply electricity more cheaply in the Cults district than the Corporation.

Mr. W. Bothwell also gave evidence, and remarked that they wished to maintain their individual position. If the County Council proposed to invade the town, he was sure they would be opposed.

After consultation in private, the Committee announced that the preamble of the Bill was found proved.

Royal Assent.—The following Bills have received the Royal assent:—

West Riding Tramways Act, 1907.
North-East London Railway Act, 1907.
Folkestone, Sandgate, and Hythe Tramways Act, 1907.
West Yorkshire Tramways Act, 1907.

Electric Lighting Provisional Orders.—The Electric Lighting Provisional Orders (Nos. 1, 2, and 4) Bills came before the Unopposed Committee (Mr. Emmott presiding) of the House of Commons on July 4th, and were ordered to proceed. The Bills confirm provisional orders granted in respect to the following towns, Aston Manor, Chesham, Hipperholme, Lytham, Newark, Penrith, Pontefract, Stockport, and the rural district of Cork. No. 4 Bill confirms an order granted to George Balfour, electrical engineer, London, in respect of the burgh of Arbroath.

Coventry Corporation Bill.—The Bill being promoted by the Coventry Corporation, came before Major Seely's Select Committee of the House of Commons on the 5th inst. The measure which principally relates to the water undertaking also contains additional provisions giving the Corporation certain powers as to the electric supply undertaking. The particulars as to the additional provisions were discussed before Lord Ribblesdale's Select Committee of the House of Lords and reported in the Electrical Review of May 10th. There was no opposition before the House of Commons Committee and the preamble was found proved and the Bill ordered to be reported to the House.

The Wireless Telegraph Convention.—The *Times*, in its "Political Notes" on July 4th, in referring to the report of the Committee on the Radio-Telegraphic Convention, says: "The report deals at some length with the relations subsisting between the Government and the Marconi Company. The Committee recognise the valuable work which has been done by the Marconi Company as the pioneers of practical wireless telegraphy; but they see no reason to apprehend that the obligations of the Convention, if faithfully carried out by all concerned, will prove injurious to the Marconi Company. They consider, indeed, that the Convention will be to the ultimate advantage of Marconi's; but if, on the other hand, it is found by practical experience that the company are injuriously affected, the Committee recommend that they should be treated with a generous consideration to which they have, however, no equitable claim. In view of the particular circumstances of the case, the Committee recommend that, provided the Marconi Company loyally co-operate in carrying out the Convention and the policy which it represents, and in the event of its being shown under proper conditions of audit, that the Marconi Company during the transition period, under the new conditions brought about by the Convention, have suffered diminution of business at their British stations, they should be granted compensation for a period of three years from the day of the Convention's coming into operation."

Post Office Telephone Vote.—A Standing Committee of the House of Commons had before it on 8th inst. the Telegraph (Money) Bill under which the Postmaster-General sought to raise six millions sterling under the Telegraph Acts, of which 99 per cent. is for telephone purposes. A proposition was made by Mr. Harold Cox to reduce the sum to three millions, his idea being that a second Bill should be brought in several years hence for raising the remainder. This would bring the administration under the review of the House of Commons. By 19 votes to 3, the amendment was defeated. The Bill was ordered to be reported to the House, with slight amendment, in its original form.

Second Reading.—In the House of Commons on Monday the Electric Supply Corporation Bill was read a second time.

Electric Lighting Provisional Order (No. 5) Bill.—This Bill came on Tuesday before the Earl of Onslow's Select Committee of the House of Lords, and was ordered to proceed.

King's Norton and Northfield Urban District Council.—This Bill came before the Earl of Onslow's Select Committee of the House of Lords on Tuesday, and the Bill was ordered to be reported to the House.

London United Tramways.—This Bill came before the Earl of Onslow's Select Committee of the House of Lords on Tuesday, and was ordered to proceed.

Norway and Electric Power Syndicates. — The *Financial News* says:—"Respecting the Norwegian law regulating the sale of real property to foreigners, it is now reported by the British Legation at Christiania that a Government proposal restricting leases or sales of electric power to foreigners was recently passed by the Storthing, and subsequently ratified by the Council of State. The law takes effect at once. The Legation remark that in order to keep the control of electric power produced by waterfalls in the hands of the Government, an addition has been made to the temporary Act of June 12th, 1906, which has been extended for a period of one year—viz., to April 1st, 1908. The provisions of the Supplementary Act are that the regulations contained in the Temporary Act regarding the right of acquisition and working of mines, waterfalls, and forests shall also apply to the acquisition of the right to electric power, produced by water power, in larger quantities than 250 h.p."

BUSINESS NOTES.

The Ironmonger's Exhibition.—At this Exhibition, which opened on Tuesday at the Agricultural Hall, the Harquin Pendant Co., of 136 and 138, Kentish Town Road, N.W., are showing the Harquin patent rise and fall pendant for electric lighting, the special feature of which is that it has no moving joint or rubbing contact, the electric wire being wound on to a fixed drum.

Dissolutions and Liquidations.—The Improved Electric Supplies, Ltd.—The following are the principal unsecured creditors:—

Auto-Claw Manufacturing Co., London	£525 18
Armorduct Manufacturing Co., London	50 12
Atkins & Dott, London	43 13
Amalgamated Dry Battery Co., London	26 18
Anderson & Duffield, Slough	43 8
Arnold & Sons, Newport, Mon.	33 10
Atlas Carbon Co., London	88 8
Allam & Co., London	28 1
Anglo-Foreign Manufacturing Co., London	21 2
Bradshaw & Sons, Retford	338 9
Bill & Co., Birmingham	79 7
British Thomson-Houston Co., Ltd., Rugby	76 4
British Insulated & Helsby Cables, Ltd., Prescot	39 7
Bradbury & Co., Birmingham	18 2
Butterworth Bros., Manchester	17 8
Bonnella & Sons, London	12 3
Beckett & Parker, Birmingham	10 0
Baxter & Caunter, London	10 5
Chamberlain, W., Cobham	400 0
Consolidated Supply Co., London	24 3
Calthorpe Box Co., London	20 3
Charing Cross and Strand Electricity Supply Co., London	20 0
Clarke, Adams & Co., Birmingham	17 18
Cole, John, West Norwood	17 17
Concordia Electric Wire Co., London	16 17
Calmont & Co., London	10 8
Cryselco, Ltd., Bedford	10 0
Duffield, Park & Co., Slough	74 16
Davis, Smith & Co., Birmingham	140 12
Doherty & Co., London	87 10
Doherty & Co., London	25 16
Dewsbury Electric Co., Dewsbury	39 3
Drake & Gorham, London	13 7
Electric and Ordinance Co., Aston	95 16
Electrical Co., Ltd., London	153 4
Friedrichswerk Erk Sohn, London	34 12
Frankenberg, I., Ltd, Salford	18 7
Fell & James, London	15 4
Falk, Stadelmann & Co., London	12 17
Goossens, Pope & Co., London	132 18
General Electric Co., London	83 5
Geipel & Lange, London	24 11
Gabriel Lamp Co., London	20 19
Guy & Co., Nottingham	15 19
Gaskett & Grocott, Longport	13 1
General Brass Fittings Co., Leeds	14 8
Hurmann Friedr, Hohenlunberg	57 7
Hill & Co., London	23 17
Hawkins Bros., & Co., London	13 6
Henry, J. S., Ltd., London	11 17
Johnson & Phillips, Ltd., Old Charlton	87 15
Johnstone, Benjamin & Co., London	28 4
Idris & Co., Ltd., London	12 3
Isenthal & Co., London	17 3
Kabelwerk Rneydt, Rheydt	887 0
Krupka & Jacoby, London	354 7
Lancashire Watch Co., Prescot	38 8
Lowden Bros., Dundee	23 9
Leutchford & Co., Upper Norwood	19 1
London and Lancashire Rubber Co., London	12 13
London and North-Western Railway Co., London	10 18
Lundberg, A. P., London	11 16
Marples, Leach & Co., London	73 12
Marsh, Sons & Co., London	43 4
McLellan & Co., Glasgow	18 5
Matthew Bros., London	11 7
Matthews & Yates, Swinton and Manchester	19 0
Newtons, Ltd., Taunton	42 1
Osterman, F. W., London	10 0
Pope's Electric Lamp Co., Ltd. (No. 1 account), London	45 17
" " " " (No. 2 ") "	104 13
Plutte, Scheele & Co., London	118 18
Phœnix Electric Co., London	40 0
Pumfrey & Sons, London	27 10
Perfecta Tube Co., Birmingham	35 18
Parrish & Chapple, Ltd., London	11 2
Roberts, E., London	26 15
Raund, A., London	23 18
Rose, T. A., London	21 14
Rene & Co., London	14 14
Rippingill Manufacturing Co., Aston	13 4
Rumney & Rumney, London	10 10
Sanders, W., Wednesbury	77 1
Staveley & Co., Macclesfield	76 5
Still & Co., London	28 9
Société Gramme, London	17 0
Scott & Co., Rangoon	15 12
Seabrook Bros., London	14 0
Spencer & Co., London	12 3
Sloan Electrical Co., London	39 4
Seeck, M., London	14 9
Stolzenberg File Co., London	10 0
Thompson, H. H., Streatham	95 9
Turner & Berger, London	18 9
Taylor, Tunnicliffe & Co., Hanley	14 6
Union Electric Co., London	908 6
Universal Battery Co., Penge	18 0
Vorwerk & Sohn, Rhenish	19 18
Wolff & Co., Benet-Bonn	10 0
Whipps & Bowine, Rochdale	10 0
Zurich Lamp Co., London	155 13

The Sphere Electrical Co., Unity Street, Bristol.—Messrs. G. B. Mayo and E. Spencer Stevens have dissolved partnership. Mr. Stevens will continue the business and attend to alldebts.

Gibbings & Chauntler, consulting engineers, 41, North John Street, Liverpool.—Messrs. A. H. Gibbings & F. Chauntler have dissolved partnership. Mr. Gibbings will continue the business under the old style.

British Electric Equipment Co., Ltd.—The following is a list of the principal creditors, viz:—

Unsecured.

Adams Manufacturing Co., London	£22 2
Alloa Iron Co., Alloa	157 14
Edgar Allen & Co., Tinsley	26 8
Armitage & Co., London	25 17
Bayliss, Jones & Bayliss, London	89 12
H. G. Beaumont & Sons, London	110 11
Brush Electrical Engineering Co., Ltd., London	225 0
Brooks, Ltd., London	1,142 4
E. Catchpole & Son, London	44 11
Carter & Stevens, London	10 1
George Cox, London	106 1
Dick, Kerr & Co., London	23 2
S. Dixon & Sons, Ltd., Leeds	25 4
W. F. Dennis & Co.	14 1
Electrical Co., Ltd., London	28 10
Eversbed & Vignoles, London	18 15
Espir, Fernand, London	638 8
Enderby and Stoney Stanton Granite Co., Narborough	24 13
Felten & Guilleaume, Carlswerk	212 14
Griffiths & Co., Ltd., London	43 12
General Electric Co., Ltd., London	10 8
W. A. Green, London	14 10
Good Bros., London	20 3
Gilbert Arc Lamp Co., Chingford	10 5
F. & S. Hartnoll, London	135 7
Improved Wood Pavement Co., London	955 17
Johnson & Phillips, Ltd., Old Charlton	75 19
Lench, T. W., Ltd., Blackheath	19 4
Lake, Sison & Brown, London	100 17
Wm. Lucy & Co., Oxford	42 6
Leyton Timber, Slate & Cement Co., Leyton	20 2
Morris-Hawkins Electrical Co., London	24 2
Morris & Lister, Coventry	11 17
Marshall S. Bent, Leyton	19 1
Maunders, W., Leyton	23 7
Millars Karri and Jarrah Wood Co. (1902), Ltd., London	273 10
P. & W. McLellan, Ltd., London	11 6
Midland Railway Co., London	34 9
North London Sand and Ballast Co., Ltd., Edmonton	63 10
Naylor, Bros., Ltd., Galborne	124 15
T. R. Nicholson, Colchester	61 0
Ohio Brass Co., Ohio	58 19
Postmaster-General, London	289 14
Russell & Sons, J., Wednesbury	634 19
Saxon Portland Cement Co., Cambridge	587 6
Shalton Bros., Ltd., Smethwick	42 1
Strachan & Henshaw, Ltd., Bristol	54 4
C. F. Swinden & Co., London	30 19
Steavenson & Co., London	15 13
Tramway and Railway World, London	46 13
Turner, Bros., Leytonstone	24 14
Verity, Ltd., London	38 18
F. Warren & Co., Ltd., Walthamstow	16 12
Wallis & Stevens, Basingstoke	12 15
Whitecross & Co., Warrington	34 0
W. H. Willcox & Co.	23 0
Wilsmer & Co., Walthamstow	14 0
Watson, J., Glasgow	13 0
H. Wood, Leyton	15 9
Yates & Co., Ltd., Jno., Birmingham	53 8
Spraggs & Ritchie, London	10 0
Wallington & Co., London	10 0
R. F. Coulson, London	21 15
H. S. Nicholson, London	300 10
F. Hayes, Leigh	89 6

Partly-Secured Creditor.

Mrs. Emma Nicholson, London	Debt	9,683 10
	Security	6,380 0
Balance unsecured		£3,303 10

Brockie-Pell Arc Lamp, Ltd.—Messrs. R. Warner, F.C.A., and Duncan Watson, M.I.E.E., have been appointed receivers on behalf of the debenture-holders, and with the acquiescence of the board. The company will go into voluntary liquidation immediately, with a view to reconstruction, for the purpose of paying all the debts and raising further capital for development and extension of the business. It is expected that the assets will be ample to pay the whole of the debentures and debts in full, leaving a fair surplus for the shareholders.

C. and H. Willis & Co., electrical engineers, 4, Ryley's Gardens, and Manchester Buildings, Liverpool.—Messrs. C. Willis, H. Willis, and W. James have dissolved partnership. Debts will be attended to by H. Willis, who will continue the business under the old style.

Thomson-Houston in Egypt. — The Compagnie Egyptienne Thomson-Houston, of Brussels, has just been formed in that city by the Mediterranean Thomson-Houston Co., for the working of the patents under this combination, and the construction and carrying on of transport undertakings in Egypt. The share capital amounts to £200,000, divided into 50,000 ordinary shares, and 6,000 founder parts have also been created. The Mediterranean Co., which will shortly be absorbed by the French Thomson-Houston Co., of Paris, transfers its manufacturing rights to the new company, and undertakes not to compete with it in Egypt, and also transfers to it the right of obtaining at cost price from the American General Electric Co., all the latter's plans, models, &c., and of procuring any necessary information on the spot in the United States. In addition to these, the new company takes over on terms arranged, the existing businesses, relations, &c., of the Mediterranean Co., exclusive of the patents and inventions purchased by the latter. The Mediterranean Co. receives for the assets set forth, the 6,000 founder parts in the new company, and the founders have also subscribed for 21,275 shares. The Crédit Franco-Egyptien has taken up 5,000 shares, the Crédit Mobilier Francais 1,250 shares, the Compagnie Francaise des Mines d'Or 2,500 shares, Constantin Achillopulo 1,250 shares, B. M. Aghion Fils 6,250 shares, J. M. Cattani Fils & Co. 1,250 shares, and B. Tilche & Sons 2,500 shares. The agreement further provides that in the event of the dissolution of the Egyptian Co., all the rights acquired by it from the Mediterranean Co. should revert to the latter, or to its successors.

Consular Notes.—Finland.—The British Consul at Helsingfors states in a report for 1906 that the imports of machinery (electrical, agricultural and other kinds), amounted in all to 11,567 metric tons against 10,215 metric tons in 1905. The value amounted to £622,440 and in 1905 to £534,160; 1,258 metric tons came from the United Kingdom against 1,015 metric tons in 1905. The import of rails to the Grand Duchy amounted to 18,047 metric tons against 12,819 metric tons in 1905. From the United Kingdom were imported 4,504 metric tons, and in 1905 only 43 metric tons. The Consul remarks on the falling off of British rails in Finland compared with what it was, say, 10 years ago, in spite of the steady and always increasing demand for rails. Most of the rails, or about 7,000 metric tons, came from Belgium, the rest from the United Kingdom, Sweden, Germany, the Netherlands, Norway and Russia, in the order mentioned. The value of the whole import was £86,640 against £51,280 in 1905. The increase in the import of rails, which will probably continue, was due to the new lines of railway under construction in the Grand Duchy. Many others are, moreover, proposed to be built in the near future.

Russia.—With regard to machinery the British Consul at Kieff states, in a recent report, that in the general machinery trade it must be confessed that so far as this district is concerned, the United Kingdom continues to lose ground. The unsettled condition of the country and the consequent risk attached to credit terms may account for the neglect, but the same conditions apply equally to Germany, which, however, continues to push trade, notwithstanding the high duty of £1 7s. 5d. per cwt. on machine tools; the requirements of the country are still imported, principally from Germany. Travellers for British firms are conspicuous by their absence. Dynamos are now manufactured to meet the requirements of the country in St. Petersburg, Moscow, Riga and Revel. What is imported is of German manufacture—lamps and electric light fittings are also principally of German make. A considerable number of suction gas plants, also for the most part of German make have been installed in this district for driving flour mills.

Colliery Installation.—The British Westinghouse Co. are supplying to the Powell Duffryn Steam Coal Co. two 950-h.p. three-phase 3,000-volt 50-period squirrel-cage induction motors to run at 1,450 r.p.m. These motors are for driving, through flexible couplings, two Worthington six-stage turbine-type centrifugal pumps, each capable of delivering 1,350 gallons per minute, against a head of 1,645 ft., including suction, lift and friction of discharge mains. The guaranteed efficiency of each set, from input at motor terminals to output at surface, is 69 per cent. These two pumping sets are to be installed in the East Elliott Pit. It is proposed to run them at night, when the haulage gears and other machinery are shut down, thus providing a night load for the power house, and making the fullest use of the generating plant.

New Italian Companies.—The Italian General Electric Accumulator Co. (Società Generale Italiana Accumulatori Elettrici) has just been formed at Milan with the co-operation of the Accumulator Works Co., of Berlin and Hagen, the Edison Electricity Co., of Milan, and the accumulator works of Engineer Dossmann, of Genoa. The share capital amounts to £75,000. It is announced that the Unione Elettrotecnica, which is a Milan company for the production of electrical machinery, is to be dissolved, and two new separate companies constituted by the partners. One will be the Società Gadda, with a share capital of £200,000, and the other will be the firm of Brioschi and Finzi, with a capital of £40,000.

The Beck Arc Lamp.—The Italian patents for the Beck arc lamp have been disposed of by the German Beck Arc Lamp Co., of Frankfort-on-Main, to R. Colombo & Co., of Rome, for the sum of £6,800.

The German Cable Makers' Syndicate.—It is reported that the syndicate of German cable makers, whose agreement was to have terminated on June 30th, has been prolonged for a period of three years.

Progress in the Combustion of Fuel.—Referring to the review of the "Engineering and Electric Traction Pocket-Book" which appeared in our issue of May 24th, Messrs. Ed. Bennis and Co., Ltd., write to controvert the statement implied in the passage:—"There is nothing in the description of boiler furnaces to lead one to suppose that any advance has been made in the economical combustion of fuel since 1899, and in this matter the book merely reflects the void which it sees." The comment contained in the words: "and in this matter the book *merely reflects the void which it sees*," they say, would lead one to suppose that there had been no advance in the economical combustion of fuel during the last eight years, whereas the records obtained in this direction by their firm, as shown by well-substantiated boiler tests made all over the country, have been numerous, and, in not a few cases, remarkable. It was only in 1906 that their new chain-grate stoker (Bennis-Miller-Bennett patents) was perfected. The abolition of the dumping bar, together with the halved links, makes it possible to burn low-priced, low-graded fuels such as have hitherto been avoided by this type of stoker. The firm has also patented a coking stoker which combines several unique movements, embodying new principles as applied to the economic combustion of fuel. "There, perhaps, never was a year in the history of the boiler house when boiler room economy has made more marked progress. Machine stoking is not, to-day, the haphazard work that it was more or less in 1899, the intervening period has been one of transition, and that transition has resulted in a practical revision of fuel costs and an all-round saving of from 40 to 50 per cent."

Electric Elevators for South Africa.—*The British and South African Export Gazette* says that whereas in the United Kingdom the hydraulic lift has a wide vogue, in South Africa, where in many places the scarcity of water presents difficulties, the electric elevator is more favoured, in spite of the difficulty hitherto experienced in finding local mechanics capable of erecting and repairing these appliances—a difficulty, however, which is being rapidly overcome. "Of course there is, and there is likely to continue, a demand for hydraulic lifts, but it is improbable that it will attain the proportion of that for the electric variety for the reason stated, and also because of the general popularity of everything electrical in South Africa. The great commercial emporiums are not the only establishments for which elevators are required. Somewhat different patterns are demanded for hotels. The Carlton, at Johannesburg, and the Mount Nelson, at Cape Town, for instance, have very complete installations for passengers, luggage, dinners, &c. As there is a decided tendency to erect more of these up-to-date caravanserais, the call for such appliances will be much extended. Altogether, there is a probability of a more than ordinary demand for electric elevators in South Africa for some years to come."

South African Trade.—It is stated that a powerful organisation is being set up to push South African products in Great Britain and British goods in South Africa. The organisation will also assist the various governments to consolidate their trade interests in this country. The headquarters will be in London, with branches in the five South African Colonies. Sir Pieter Bam is the originator of the scheme, and after forming an executive committee in London, he will leave for South Africa in a few weeks in order to complete the organisation in the South African Colonies, returning to England early next year.

In the Commons on 8th inst., a question was asked with regard to the exports to British possessions of articles completely manufactured and ready for consumption. The questioner asked what were the principal items and colonies accounting for the decline from £46,500,000 in 1903 to £41,200,000 in 1904. Mr. Kearley, in reply, said that the principal items were apparel, iron and steel manufactures, steam engines, leather wares, railway wagons, and haberdashery, and that practically the whole of the decline occurred in exports to South Africa.

Trade Announcements.—The business of the New Century Arc Light Co., Ltd., including patents, goodwill, plant, stock, &c., which was offered for sale by tender, has been purchased by Messrs. Broom & Taylor, engineers of the company, who have been associated with the business ever since its formation, and will carry it on without interruption as the New Century Arc Light Co.

Mr. A. G. Cuthbert, who formerly represented Messrs. Crompton & Co., Ltd., in Ireland, has been placed in charge of their Manchester district, the office for which is situated at Woodall's Buildings, 42, Deansgate.

Messrs. T. Harding Churton & Co., of Atlas Works, Leeds, have appointed Messrs. Andrews & Co., of 198A, St. Vincent Street, Glasgow, to be their agents in Scotland for the sale of their alternating current motors.

The Unbreakable Pulley and Mill Gearing Co., Ltd., of West Gorton, Manchester, have just appointed The Engineering and General Equipment Co., 9, Scale Lane, Hull, sole agents for the sale of their specialties in Hull and district.

The Hudson Economiser Co. (1907), Ltd., of Gloucester House, 2, Bishopsgate Street Without, London, E.C., have purchased the business and all patent rights of The Hudson Economiser Co., Ltd., and have made arrangements for continuing the business under the above title. We have received a 32 pp. pamphlet describing their Hudson patent oil separator, feed-water heater and softener, condensing plant, cooling tower, &c.

Burglary.—On Tuesday night last week burglars entered the show-rooms of Mr. Paul, the well-known electrical instrument maker, at 63, High Holborn, but found themselves too late, as the cashier's department was removed on the previous day to the works at New Southgate. They secured only a few pounds in cash, and some cigars.

Catalogues and Lists.—Messrs. Mavor & Coulson, Ltd., Glasgow.—July date card, giving particulars of a record of a month's working of a Pick-Quick electric coal-cutter.

Messrs. Monte-Callow & Co., Ipswich.—16-page pamphlet, describing their electric capstans for direct and alternating current, direct-acting and gearing, 1,120 to 2,240 lb. pull.

The Electrical Co., Ltd., Charing Cross Road, W.C.—Leaflet No. XIII, 283/62, showing some of their different types of electric fans.

Messrs. Alfred Herbert, Ltd., Coventry.—Copy of sixth edition of their J section catalogue, giving a very full account, well illustrated as usual, of their Hexagon turret lathes.

Messrs. D. Santoni & Co. (1906), Ltd., London, E.C.—Illustrated publication, No. S 2, being a 20-page price list of their electric bells, telephones, indicators, batteries, and incidental accessories.

Messrs. Turners & Manville, 5, Lloyd's Avenue, E.C.—Small 12-pp. pamphlet containing a description of the "Victor" direct current type combination meter.

The Key Engineering Co., Ltd., 4, Queen Victoria Street, E.C.—"Fibre Conduit Picture Book," being a collection of a couple of dozen half-tone illustrations, showing their fibre conduits. On alternate pages a few descriptive words relating to the product are given.

MESSRS. J. C. LYELL & Co., LTD., 55, Victoria Street, S.W.—Leaflet quoting prices of metallic filament lamps.

MESSRS. ANDREW BARCLAY, SONS & Co., LTD., Caledonia Works, Kilmarnock.—Card drawing attention to their Lion Babbitt anti-friction metal.

THE LONDON ELECTRICAL FITTINGS Co., LTD., 15, Newman Street, Oxford Street, W.—A few weeks ago, in illustrating some of the recent designs of electric light fittings produced by this company, we mentioned that a new catalogue was in course of printing. This has now been issued, and in the course of some 162 pages it gives illustrations printed in a warm brown tone of a great variety of artistic designs, which should meet with a ready acceptance among those who want high-class fittings. This is a considerably larger catalogue than previous editions issued by the company; it has been carefully compiled, and forms a most attractive collection representative of the firm's work. From the same company we have also received a catalogue of the products of the "Wandsworth" Electrical Manufacturing Co., Ltd., including switchboards, tumbler switches, switch covers, wall plugs, ceiling roses, fuse-boards, and so forth. We note that with their No. 15 patent link switch they send out a five years' guarantee label. A 10-ampere size switch of the same type is illustrated, as is also their two-way high voltage tumbler switch, and an iron-cased water-tight switch, which, we understand, is meeting with great success. Their latest type of iron-cased fuseboards and high voltage distribution boards with tubular bridges are likewise included. The Wandsworth Co. last week moved to larger premises owing to increased business, and the address is now Imperial Works, Ludgate Hill, Birmingham, but all inquiries for their goods in the London area should be sent to the London Electric Fittings Co. at the above address. The new works are thoroughly adapted for their manufactures, and the largest type switchboards can now be coped with.

THE ADAMS MANUFACTURING CO., LTD., LONDON, W.—New leaflet, fresh from the press, describing a type of automatic starting rheostat which they have evolved to meet those cases where it is desired that an alternating current motor of the induction type, either two or three-phase, shall be started and stopped from a distance by means of a pilot circuit, or when it is desired to control the motor by means of the level of the water in a tank or by the variation of pressure in the reservoir of an air compressor. These starters have been standardised in sizes up to 150 B.H.P., but can be furnished in much larger sizes. They are an example of a practical application of an alternating current solenoid to switch closing, and are claimed to represent a solution of the problem of obtaining a cool running and noiseless solenoid whose cost is not prohibitive.

Annual Outings.—The Manchester branch of MESSRS. VERITYS LTD., held their annual picnic on Saturday, and travelled to Bakewell, where lunch was provided. A coach drive followed to Chatsworth, where, by courtesy of the Duke of Devonshire, the party went over the house, conservatories and grounds. A coach drive to Haddon Hall and Matlock Bath followed, and at the latter place dinner was served. The toast of the Manchester head, Mr. M. B. Cotterell, who was unavoidably absent, was drunk with enthusiasm, and later that of Mr. W. de M. Landon (head of the plant department, Manchester). Other toasts followed, and a vote of thanks was passed to the hon. secretary, Mr. F. G. Ride. The return journey was made by train from Matlock Bath.

On Monday last week the staff and friends of MESSRS. J. H. HEATHMAN & Co., of Parsons Green, were entertained to a launch trip from Richmond to Staines and back on *The King*, a steamer hired from Harry Tagg. The company numbered 111, and luncheon, tea and other necessities were liberally provided. There was a continuous run of music, singing, recitations, &c. The cordial relations existing between Mr. Councillor Heathman and his employés was proved by the sociability of every one on board, and at the close of the day's outing, Mr. Stark, who has been with the firm for 13 years, moved a hearty vote of thanks to Mr. Heathman, which was seconded by Mr. Mitchell, the general foreman, and given with round after round of cheers.

On Saturday, the 6th inst., the employés of MESSRS. RAWLINGS BROS., LTD., held their annual outing at Eastbourne in brilliant weather. The majority of the employés journeyed direct from London, but several of the number had made their way across country from various country seats where the firm is now carrying out works. Dinner was served in the Central Hall, Seaside Road. Mr. W. R. Rawlings, one of the managing directors, was in the chair, and in giving the toast of "The Employés," he expressed regret that so many had been prevented from being present, owing to several large contracts that were in hand in various parts of the country. Mr. E. G. Nicholson gave the toast of "The Firm," which was responded to by Mr. J. J. Rawlings in suitable terms. Mr. T. S. Rowden asked the company to drink to the health of the chairman and managing directors. Mr. R. Tweedie Smith, the chairman of the company, in responding, remarked that he had no idea until that moment that he was such a jolly good fellow as Mr. Rowden had made out. After Mr. Clarke had proposed the health of the visitors, responded to by Mr. J. Milton, the company dispersed to enjoy the attractions of the neighbourhood.

Electricity Meters in Australia.—According to advices received by this week's Australian mail, Councillor Potts, at a recent meeting of the Kalgoorlie (W.A.) Town Council, moved that no more Bastian meters be purchased unless specially authorised by the Council, and that a special committee be appointed to inquire into the working of same. There was, he alleged, dissatisfaction with the meters named, and he questioned the capacity of the electrical engineer and his staff to understand them. The staff said they could not get the right quality of oil. Only a chemist could understand that aspect of the question. Councillor Clemenger, in opposing the motion, said it had to be proved that mechanical meters gave more satisfaction than the Bastian type. The substitution of the former for the latter would mean an outlay of £4,000. Two meters—one a Bastian and the other a mechanical meter—had been put up in the Council Chamber, and the result was that there was no difference between them. People always had grumbled, and always would grumble at meters, but the solid fact remained that in Kalgoorlie no more units were paid for than were generated. If mechanical meters were adopted, a skilled mechanic would have to be engaged to adjust them whereas any lad could attend to a Bastian which was out of order. Mr. D. Curle Smith, the electrical engineer, described to the councillors the construction and action of the Bastian meter, and went on to say there were 1,220 of these meters in use in the municipality. The average of complaints was $1\frac{3}{8}$ per cent. per month. He had not been able to get any meter which caused fewer complaints than the Bastian meter, and he had yet to find a mechanical meter which would correctly register an 8-C.P. light. The quality of the oil had much to do with the efficiency of the Bastian meter, and he had now got the proper kind of oil. Councillor Rickarby said his own meter had worked very satisfactorily up to January, when it went wrong, and subsequent testing showed that it registered 40 per cent. too much. But he did not blame the meters, but the way they were looked after and the positions in which they were placed. They were often exposed without protection to the intense heat of the climate. On a division, the motion was negatived by 5 votes to 4. It was resolved to write to the local authorities of Melbourne, Sydney, and Perth (W.A.) to ascertain what meters were used in those cities. The electrical engineer was instructed to prepare a report upon the advisability of protecting the meters in Kalgoorlie from the intense heat and placing them in better positions.

Book Notices.—The British Standard Specifications for Material used in the Construction of Railway Rolling Stock (Report No. 24) have been revised, and will shortly be available. Copies of the report, price 10s. 6d., or post free 10s. 10d., can be obtained from the publishers, Messrs. Crosby Lockwood & Son, or from the offices of the Committee.

"Regulations for Technical Schools, &c., for Further Education." [Cd. 3,555.] London: Wyman & Sons. 1907. 2d.

"Uber die Einfuhrung des elektrischen Zug-betriebes auf den Berliner Stadt-Ring-und Vorortbahnen." By Dr. W. Reichel. München and Berlin: R. Oldenbourg. 1907.

"Untersuchungen über die Durchschlagsfestigkeit der Gase in ihrer Abhängigkeit vom Gasdruck." By Dr. W. Voege. Berlin: Julius Springer.

"Kabelmessungen und Versuche mit Telephon-Frequenzströmen." By Béla Gáti. Berlin: Julius Springer.

"Transactions of the N.E. Coast Institution of Engineers and Shipbuilders," Vol. XXIII, Parts 4 and 5. June, 1907. London: Andrew Reid & Co.

"Proceedings of the American Institute of Electrical Engineers." Vol. XXVI, No. 5. May, 1907. New York: The Editing Committee. 50 c.

"Metric Weights with English Equivalents." By H. P. McCartney. London: E. & F. N. Spon. 1907. 1s. net.

"Electric Blasting Apparatus and Explosives." By Wm. Maurice. London: The *Electrician* Printing and Publishing Co., Ltd. 1907. Price 8s. 6d. net.

"Directory of the Engineers' Club of Philadelphia." Corrected to May, 1907.

Bankruptcy Proceedings.—R. S. BLACKBURN, electrical engineer, Hebden Bridge and Todmorden.—The statement of affairs in this case shows a deficiency of £1,051. Debtor informs the Official Receiver that since June 4th, 1906, he has lost £200 in the business. He attributes his failure to expenses through illness and pressure by creditors.

C. W. STAFFORD (Stafford Bros.), electrical engineer, Toll End Road, Tipton.—The first meeting of creditors was held on July 3rd at Dudley. The statement of affairs showed liabilities amounting to £286 and a deficiency of £164. Bankrupt ascribes his failure to bad trade, competition, and bad debts. The matter was left in the hands of the Official Receiver.

T. HEFFERMAN.—The public examination was held on Thursday, July 4th, before Mr. Registrar Hope, at the London Bankruptcy Court, of Thos. Hefferman, electrical engineer, 148, Holland Road, Kensington, who applied to pass upon accounts showing liabilities £965, and no assets whatever. In the course of his evidence the debtor stated that his failure was brought about by the non-success of certain patents in which he was interested, and by the omission of the New Electricity Supply Syndicate, Ltd., to purchase a battery of his invention. The examination was concluded. The following are the principal unsecured creditors:—

Bowley, E., Highgate..	£868 12 9
Campbell, R., Holland Road, W.	589 17 4

Franco-British Exhibition, 1908.—It is stated that the Engineering Section of this Exhibition, which already covers several hundred thousand feet of floor space, of which one-half will be devoted to the British Section, may have to be materially increased, as from present indications it is anticipated that the demand will far exceed the space at disposal, notwithstanding the fact that it will be the largest machinery hall ever constructed for an exhibition in this country. Separate sectional committees are now in course of formation, with the view of making the engineering and shipping departments the most important ever held.

For Sale.—Certain arc lighting plant. See an advertisement in this issue.

The Business Exhibition at Olympia.—There remains open at Olympia until to-morrow night (July 13th) a Business Exhibition arranged by the Organiser Publishing and Exhibition Co., Ltd. It is not a gigantic affair, and there is something of a monotonous similarity between a number of the exhibits, but it is a show at which many of those who have to do with the commercial and office direction of electrical trading and supply undertakings might spend a profitable hour. It is the first exhibition of its kind, but in these days of improving office methods, higher organisation (and sometimes over-organisation), there is a reasonable prospect of it becoming an annual and more important affair. Card index systems, filing cabinets, typewriters, roll-top desks, and so forth, are there in number; and there are such things as carpets and linoleum for office furnishing, in fact, everything going to make up a complete office equipment. Synchronome electric clocks are displayed. Messrs. Howard Bros. have an exhibit of the Dey time register; the Library Supply Co., of 181, Queen Victoria Street, E.C., show a compact and handsome catalogue filing and indexing cabinet, as well as general "Libraco" filing and card index cabinets. The Rockwell-Rabash Co., Ltd., show a model office in operation for a number of hours daily, and filing and card systems are prominent as part of the equipments exhibited by them. Messrs. Partridge and Cooper likewise show card index systems, as do also the Globe-Wernicke Co., Ltd., Messrs. Kenrich & Jefferson, Ltd., and the Amberg File and Index Co. There are exhibitors who are prepared to give you wrinkles as to advertising if you are an advertiser, and others who will help you to bring the advertiser and his "copy" to your feet if you happen to be a publisher. There is at one part of the building an exhibit showing you how shorthand may be learned in a twinkling, and at another part we were very much impressed with an exhibit whose chief advantage is the elimination of the shorthand writer. This latter exhibit is known as the "Dictaphone," and is sold by the Columbia Phonograph Co., of 64 and 66, Oxford Street, W. The equipment consists of a recording machine, connected to the lampholder of your ordinary electric lighting circuit, into which you dictate your letters (or articles); these are impressed upon a record which is removed whenever desired and is placed on another machine in the typists' (or linotypists') own room; the speed of "taking off" may be easily regulated by the operator according to his or her rate of speed of manipulating the typewriter. In offices where there is a great deal of correspondence to be handled we can imagine the "Dictaphone" as rendering invaluable service as a quiet and efficient aid. It speaks for itself. The Automatic Folding Machine Co. have an interesting little paper (circular and letter) folding machine operated by electric motor, or by hand. Messrs. C. Larkins & Co. are practically alone in showing electric light and similar fittings for offices, though a feature of some in oxidised silver finish is present at one of the office furniture stands. Half-tone blocks, printing, mechanical calculations, and many other things are to be seen, and there are present firms who will find you any man you are in want of to do anything you may desire in the way of office organisation, reorganisation, or equipment. The exhibition would be worth a visit, even if only to let some who have got into an old clogged-up groove, catch the spirit of the modern movement in these matters.

LIGHTING and POWER NOTES.

Australia.—The electric lighting of Essendon, one of the northern suburbs of Melbourne, is to be undertaken by the North Melbourne Electric Lighting and Tramway Co., Ltd. An offer of the company to supply 450 street lamps of not less than 32 C.P. each for a term of 10 years, at schedule prices, has been accepted by the Municipal Council.

Bootle.—The past year's working of the electrical department has been such as to leave a surplus revenue sufficient to pay interest, sinking fund, a contribution towards depreciation, and a sum of £700 for the relief of the rates, leaving a balance of £360 to carry forward. It is stated that the Electricity Committee endeavoured to enter into an arrangement to supply electric current in Litherland, but no proposal could be found acceptable alike to the Bootle Corporation and the Litherland U.D.C., so the negotiations were discontinued.

Continental Notes.—ROME.—After having considered the schemes proposed by the Società Anglo-Romana and others, the Municipality has finally decided in favour of a municipal scheme, which has already received the approval of the Administration. The plans of the Municipality contemplate an expenditure of 3,605,000 lire, of which 100,000 lire are allocated to the acquisition of land, 1,937,250 lire for various works, buildings and equipments, and the balance for machinery, plant, &c.; the works, &c., being carried out by contract and the machinery acquired by means of public tenders.

BELGIUM.—La Compagnie Generale Electrique has just commenced operations at Conflans-Jargny, Belgium, for the erection of a central station for the generation of electrical energy for lighting and power purposes in the district. The initial plant will have a capacity of 1,000 H.P., but this will be increased later to 3,000 H.P.

Crewe.—The T.C. on July 4th decided to apply to the L.G.B. for a loan of £3,000 for the provision of a new feeder switch station, steam balancers, mains, and services.

Dunfermline.—Messrs. Buchan, consulting engineers, have advised the T.C. that it would be advantageous to come to an agreement with the Fife Electrical Power Co. rather than to put down an independent municipal generating plant.

Edinburgh.—The profits on the electric lighting undertaking for the year ending May last amounted to about £10,500. The net surplus, after making the payment to reserve indicated by statute, will be about £8,500. This amount, it is understood, the Committee is willing should be appropriated for the relief of rates.

Felixstowe.—The U.D.C. has accepted the offer of the Electric Supply Co. for street lighting at £2 15s. per lamp per annum.

Gateshead-on-Tyne.—Messrs. Haggie Bros., Ltd., have recently introduced electricity for the complete operation of their extensive rope works, and within the past few weeks two additional 150-H.P. slow speed motors have been put to work, replacing steam engines in the operation of two benches, which have about 20 wire-drawing benches. The power, which is taken from the County of Durham Electric Distribution Co.'s mains, is transmitted by means of a rope drive on to the main shaft, which again drives the blocks by means of bevel gearing. The motors, supplied by the Lahmeyer Electric Co., Ltd., run on 440 volts, 40 cycles, alternating current, and are of the slip-ring type, fitted with special brush-lifting and slip-ring short-circuiting gear.

Harrogate.—The T.C. has decided to reduce the price of electricity to ordinary consumers taking 3,000 units per annum, with a load factor of not less than 10 per cent., to 6d. and 1½d. per unit, or on a flat rate to 1d. per unit and £9 per annum per KW. demanded, less 5 per cent.

Hartlepool.—The T.C. has referred to a special meeting of the Corporation the proposed transfer of the E.L. powers possessed by the Northern Counties Electric Supply Co. to the Cleveland and Durham Electric Power Co., under which the maximum price for energy for private lighting is to be 4d. per unit, instead of 6d. as at present, and for public purposes 2d. per unit.

Holywood (County Down).—At a meeting of the U.D.C. last week, a letter was read from Messrs. M'Lean & Sons, Belfast, on behalf of the Holywood Tramways Co., who, it was stated, intended to apply to the Board of Trade for a provisional order under the Electric Lighting Acts, 1880-6, for supplying electrical energy in portions of Holywood, and the rural district of Castlereagh, near Belfast. The chairman, Major M'Cammond, explained that some time ago the promoters went to Parliament with a Bill for sanctioning the building of a tramway line from Belfast, but they had come to a deadlock with the Belfast Corporation. The promoters did not go on with the Bill, owing to the difficulties that had then arisen, but now they proposed to build the line. The Council decided to form a committee to go thoroughly into the matter with regard to the lighting of the town and the tramways. Originally, the Council heartily supported the scheme.

India.—The big electrical works which are being erected in Kashmir for developing power from the Jhelum River, below Baramulla, are making good progress towards completion. A flume capable of carrying 20,000 H.P. has been completed, and turbines to develop 5,000 H.P. are now being installed. They will generate electrical energy for use in the mills and other institutions in Srinagar.

Leyton.—The question of paying the wages of permanent officials out of a loan for work which they would be engaged in carrying out, came up at a L.G.B. inquiry on Tuesday, when sanction was asked to a loan of £3,000 for mains and cable junctions. It was hinted that the Council's workmen, who were permanently engaged in carrying out service connections, could, in order to meet the requirements of the L.G.B., be discharged and re-engaged for the special work and after its completion reappointed to the staff again. That such farcical proceedings should be necessary in dealing with ordinary commercial extensions, appears, in this particular instance, to be unworthy of the Government Department concerned.

Llansamlet (Glamorgan).—The R.D.C. has decided to apply for a prov. order for E.L., and to engage an expert to advise on the scheme. It is proposed to harness the water supply at Glanbran.

London.—SOUTHWARK.—The Electrical Committee of the B.C. has, after a successful trial of the Excello flame arc lamp for street lighting, decided to convert 80 further arcs to that pattern, at an estimated cost of £800.

HAMMERSMITH.—The revenue of the electricity department for the last financial year amounted to £37,302; working expenditure claimed £21,753; and financial charges £15,535, leaving some £14 surplus. This compares with £2,631 in 1905-6, and £5,283 in 1904-5; the decrease is presumably due to the great reduction in price a year ago, as in spite of the larger output, the revenue is only some £300 in advance of the 1905-6 figure. Some 4½ million units were sold, 127,764 8-C.P. lamps being connected.

WOOLWICH.—As a result of a trial of generating by coal only at the Plumstead Works, the B.C. has agreed that the charge of 6d. per unit sold, for steam from the destructor, should be reduced to 5d. in future, the former charge being excessive. The B.C. has taken up a loan of £16,394 from the L.C.C.

Hornsey.—The returns of the Council's electrical undertaking for the year ending March 31st last show total receipts amounting to £11,604, working expenditure amounting to £4,552, and after providing £100 for bad debts, a gross profit of £6,952. After meeting financial charges, however, a deficit of £1,421 remains. Some 644,733 units were sold, including 80,697 units for public lighting, which embraces 58 arc and 126 metallic filament lamps.

Marylebone.—The inherent rivalry which characterises the motor-'bus where electric traction is concerned, took an astonishing turn on Tuesday night, when an untamed vehicle belonging to Messrs. Tilling charged an arc lamp standard in Regent Street, and succeeded not only in demolishing itself and the standard, but in putting the whole of the street into darkness.

Street Lighting in the Gas Light and Coke Co.'s District.—In consequence of the rise in the price of gas by this company from 2s. 2d. to 2s. 5d. per 1,000 cb. ft., suggestions have been made by members of the Borough Councils north and south of the Thames that arrangements should be made, if possible, for the extension of electric street lighting. The electrical engineer of Hammersmith has been instructed to report as to the advisability of lighting by electricity all the public lamps in the streets where mains are laid.

Longton.—A L.G.B. inquiry was held on July 4th, relative to the application of the T.C. for a loan of £2,000 for electricity purposes, which will be applied to the provision of additional steam plant. There was no opposition.

New Romney.—Messrs. Foote & Milne have informed the T.C. that they intend applying for a prov. order for E.L.

Northfleet.—The U.D.C. has decided to hold Gravesend T.C. to the terms of its letter of February 7th last, in which it decided to supply electricity in Northfleet. As intimated in a recent issue of Electrical Review, Gravesend T.C. had decided to abandon the extension to Northfleet for financial reasons. It is hoped that a compromise may be arranged between the two bodies.

Norwich.—A L.G.B. inquiry was held on July 3rd into the application of the T.C. for power to borrow £25,000 for the purposes of the electricity undertaking. It was mentioned that owing to the urgency of securing additional plant, orders had been placed for a steam dynamo and boiler feed pumps, thus anticipating the L.G.B. consent.

Oldham.—A profit of £1,459 has accrued from the past year's working of the E.L. undertaking, notwithstanding that the price of energy had been lowered. The T.C. has now reduced the price of energy used between 6 p.m. and 10 p.m. to 4d. per unit for all purposes, and from 10 p.m. to 6 p.m. to 1½d. for lighting, and 1d. for power.

Rye (Sussex).—With reference to the application for a prov. order for E.L. to be made by Messrs. Foote & Milne, the T.C. has intimated that the Corporation reserves the right to oppose.

St. Helens.—Subject to the consent of Richard Evans and Co., Ltd., the Lancashire Electric Power Co., and the St. Helen's Tramway Co., being obtained, the T.C. has decided to supply electricity in bulk for street lighting to the Ashton-in-Makerfield U.D.C. at 2d. per unit.

South Shields.—It has been decided to place £500 to the relief of the rates, and the balance of the net profit, £2,688, to the reserve fund. It has also been decided to abolish meter rents, as from the commencement of the April quarter.

Tunbridge Wells.—The T.C. on July 3rd decided to supply energy for motors exceeding 5 H.P., and where the use of motors is restricted to the hours between 11 p.m. and dusk the following day, at 1¾d. per unit, a reduction of ¾d., provided the consumption is not less than what would be taken by the rated H.P. of the motor running four hours per day minimum, allowing four working days per week.

Warrington.—The T.C. has informed the R.D.C. that it intends applying for a prov. order for E.L. within the Council's area. When the matter came before the R.D.C. on July 3rd, several members opposed consent to the application, and it was decided to defer action until a copy of the order had been procured.

Watford.—The L.G.B. has forwarded to the U.D.C. sanction for a loan of £8,151 for electricity purposes. The Council applied for £9,032. In granting £2,591 for the equipment of a transforming station provided for the sole purpose of supplying printing works, the L.G.B. intimated that the Council acted imprudently in entering into an agreement for supplying energy at so low a rate as 1d. per unit, as it should have been obvious that it would entail a further loss on the undertaking. This portion of the loan was limited to five years.

West Ham.—The E.L. Committee has decided to recommend the Highways Committee to adopt single-light 50-C.P. Osram lamps, at a charge of £2 12s. 6d. per annum (the Highways Committee providing the column and lantern), for the public lighting of streets other than the tramway routes. It has been decided to increase the clerical staff of the electricity department, owing to the greater amount of work now dealt with.

Yarmouth.—A L.G.B. inquiry was held on July 4th into the application of the T.C. for a loan of £7,000 for additional steam plant for tramway purposes, mains, and meters, and for £1,235 excess expenditure; there was no opposition.

TRAMWAY and RAILWAY NOTES.

Barton (Lancs.).—The R.D.C. has decided to consent to the application of Manchester T.C. for an extension of time for the construction of the tramways through Davyhulme and South Barton.

Continental Notes.—Spain.—The British Consul at Barcelona, in a recent report, states that in that port there is perhaps a more complete system of electric tramways than in any other city in Europe. German and Belgian companies control the whole of the numerous lines, the only British concern having been sold to a Belgian syndicate about a year ago. Various small extensions have been made during the year. A German company has carried a line through one of the principal arteries connecting the city with the neighbouring residential suburb of Bonanova and the Belgian Co. owning the Sarriá to Barcelona Electric Railway, has extended its line about 1½ kiloms. to the foot of the hills, and thence built a funicular railway to the mountain village of Vallvidrera.

Finland.—The British Consul at Helsingfors states that the Finnish Senate has appointed a committee to investigate the question whether some of the rapids or waterfalls in the Grand Duchy could be utilised for purposes of electric traction. A committee has considered Wallinkoski, Myllykoski and Kyrönkoski Rapids on the River Vuoksen, in the Government of Viborg, as suitable, and negotiations have been entered into for the purchase of the same for the Government.

Copenhagen.—The electric tramway system at Copenhagen, which is owned by a company, is now threatened with absorption by the municipal council, which is dominated by a majority of social democrats and radicals, who are at variance with the remaining members on this particular question. According to the original agreement concluded between the company and the council, the undertaking of the former is to pass into the possession of the latter, free of charge, on August 1st, 1938, but it is possible for the transfer to take place as from August 1st, 1908, if the agreement is denounced 13 months previously and on payment to the company of the full value of the enterprise. On its part, the company is under the obligation to pay to the town a percentage of the receipts and also to purchase power from the council's generating station. The amount payable under these arrangements is about £54,900 per annum, and is increasing year by year. If the municipal council were to acquire the undertaking next year, about £1,100,000 would have to be paid for it. As, however, financial difficulties exist locally, the magistrate recently advised the council to postpone the suggested transfer to a more favourable period, but this counsel has been rejected, and municipalisation decided upon by 25 votes to 14. The system of Local Government prevailing in the Danish capital renders it necessary for the magistrate to again consider the question, and if he should adhere to his former decision, as is expected, the matter will be referred to the Minister for Home Affairs for final settlement.

Milan.—A collision occurred between a goods train coming from Turin and an electric train proceeding in the direction of Porto Ceresio, at Rivio Vignerano, outside Milan, last week. Several persons were injured, and several wagons left the rails, while much damage was done to the rolling stock and the permanent way.

Derby.—At the monthly meeting of the T.C. it was pointed out that the time authorised for the completion of the tramways by the Derby Corporation Act of 1901 would expire in August of next year, but it was not proposed to proceed with the construction of the whole of the lines before that date, and, therefore, if it was intended to electrify some of the outstanding routes it would be necessary to apply for an extension of the time limit. The Council has decided to apply £5,000 towards the reduction of the loan borrowed in connection with the acquisition of the old tramways undertaking. The purchase loan was £34,834, of which £18,662 had been paid.

London.—L.C.C.—At its meeting on Tuesday, the Highways Committee presented a further report on the question of providing a central car repairing depôt. It appeared that at the present time about 700 electric cars are operated, and the number will be increased to 1,000 next year. The temporary repair depôt at the New Cross car shed is no longer able to cope adequately with the larger number of cars. As a result of congestion there, night shifts have to be worked in the smithy and machine shops, and the workmen have to be paid extra rates for these shifts. This entails an additional cost of £1,000 a year, but the work is considerably behind hand, and the depreciation in the value of the rolling stock which this state of affairs, if long continued would entail, is a serious matter. When the cars were comparatively new, the repairs necessary were not extensive, and these could be done at the particular depôts from which the cars were operated. This arrangement is, however, no longer practicable in view of the increase in the rolling stock, and the greater repairs which have to be executed as the cars become older. In addition, it would not be economical to provide machinery and plant at each depôt for repairing and overhauling, as this would involve the provision of separate staffs and materially increase the cost of supervision. In the circumstances, the Committee is of opinion that special repair shops should be provided on a convenient site, where all the cars can be periodically and systematically overhauled, and it recommends the Council to

approve an estimate of £51,400 for the erection of the first section of the proposed buildings, and of £16,000 for the purchase of plant, tools and machinery. The consideration of the proposal was adjourned for a week.

Highgate.—The Highgate Hill Tramways, Ltd., has applied for a renewal for seven years of the licence to use cable traction on the Highgate Hill tramways, and asking whether the B.C. has any objection to offer to this request. The communication has been referred to the Works Committee of the Local Council for consideration and report.

Mexico.—The construction of two electric tramway lines in Mexico City by the Compania Limitada de Tranvias Eléctricos de Mexico is authorised. The Empresa del Ferrocarril Industrial de Puebla has been authorised to institute electric traction on the lines belonging to that company. The company is authorised to import free of duty all the rolling stock required for the new system of traction, provided that all the materials required are imported at one and the same time.—*Board of Trade Journal.*

Morecambe.—The question of municipalising the Morecambe tramways, now owned by a private company and worked by horse traction, was considered at a meeting of the T.C. on Monday last. The present company's authority expired on June 4th, and notice of intention to purchase is required to be given within six months from that date. The Finance and General Purposes Committee having recommended that the system should be electrified, under Parliamentary sanction, the Council was now asked to endorse the proposal. Mr. Gardner, manager of the Chester Corporation tramways, it was said, estimated the cost of purchase and reconstruction for electrification at £46,093. After allowing for the fluctuations between summer and winter traffic at Morecambe, there would be a probable income of £10,390, and a balance of £3,689 for reserve and renewals. It would be necessary to spend £10,000 in additional plant at the electricity works. The Committee's report was approved by 14 votes to 4. The Mayor (Mr. S. Wright) and Councillor Stott, being directors of the tramway company, did not attend the meeting.

Morley.—Application has been made to the B. of T. for the transfer of the uncompleted portion of the Spen Valley and Morley Light Railway Order from the B.E.T. Co. to the Leeds and Bradford District Tramways, Ltd.

Newcastle-on-Tyne.—At a meeting of the T.C. on the 3rd inst., a report was submitted by the Tramways Committee as to workmen's tickets, and suggested extensions of the fare stages. The Committee proposed that workmen be allowed to travel four times in an ordinary day—morning, dinner-time and at night, and twice on Saturdays for a weekly ticket of 1s. over a distance of 1½ miles. A ticket for double the distance would be 1s. 10d., and 2s. 9d. a week would be charged for what had been 1½d. fares. Reduced fares were also proposed for clerks, shop girls, &c., earning small wages. The fare stages were also in many cases extended. It was pointed out that there was a risk of losing £9,000, but there would be a benefit in the increased traffic. The proposal was adopted as an experiment for six months.

Sheffield.—The accounts of the Corporation Tramway Department for the year ending March 25th last, recently published, show a balance on the year's working of £45,696—an increase of £9,101 as compared with the previous year. The total income was £279,586, of which £276,907 was from fares, and the remainder, £2,679, from advertisements on cars, rents, &c. The passenger receipts exceeded by £20,470 the amount received last year. A sum of £4,116 has been transferred from accumulated surplus funds for the relief of the district rate, but, owing to the earnings of the fund (£911), there is a reduction in the fund of £3,206 only. The available amount accumulated out of revenue is £196,278. The number of car-miles run was 6,804,656, and the number of passengers carried 73,966,299. The department has 1,505 employés, and 253 service cars.

Thornaby-on-Tees.—Owing to the brakes refusing to act in consequence of the rails being greasy, an electric tramcar proceeding down a steep bank at Thornaby-on-Tees, could not be pulled up at a loop line, and ran into a car from Middlesbrough. Both drivers had fortunate escapes. The fronts of the cars were knocked in and several passengers suffered from shock.

TELEGRAPH and TELEPHONE NOTES.

Brazilian Telegraphs.—The *Review of the River Plate* says that the Platino Brasileno Telegraph Company, of Montevideo, have signed the contract under which their telegraph system is ceded to the Uruguayan Government. The price is to be liquidated at the rate of $400 per month as from July 1st (when the lines were handed over to the Department of Posts and Telegraphs) until December 31st, 1914.

Colonial Wireless Telegraphy.—It is stated that the first case of the establishment of radio-telegraphic connection between the colonies of a European power and the Motherland will be brought into existence on the completion of the Marconi station at Coltans near Pisa, which is in course of construction, and will have a comprehensive scope of activity. According to a Bill introduced in the Italian Chamber by Signor Tittoni, the *personnel* of the Navy is to erect networks in Morocco, Benadir and Erytrea. The network in Erytrea is to comprise four stations for short distance work at Girunbo, Brava, Merca and Etala, one station for medium distance work at Lugh, and two stations at Mogadiscio and Massana or Asmara respectively for long distance transmission. The two latter stations will be able to communicate with the beforementioned station at Coltans.

Italian Telephones.—The Minister of Posts and Telegraphs has introduced in the Chamber the Bill, which was foreshadowed at the beginning of last winter, proposing to authorise the acquisition by the State of the telephone undertakings hitherto worked by the two companies known as the Generale Italiana and the Alta Italia. The scheme relates to 27 urban networks, and 18 long-distance lines. According to the provisions of the Bill, the purchase-price is to be paid in 11 annual instalments out of the working receipts of the telephone service, and the purchase price arranged from the calculations of a committee, which have been undertaken during the past two years, is said to be very advantageous to the State. The Government promise with the nationalisation of the service, not only a further extension and improvement of the system, but also the possibility of lower charges in the near future. But there are not lacking critics who venture to predict the failure of the scheme of nationalisation in view of the unfortunate experience gained by the public owing to the recent transfer of the railways to the State.

Newcastle-upon-Tyne.—The P.M.G. will shortly commence the construction of the following additional trunk lines for the Newcastle-upon-Tyne district:—Newcastle-London (four lines), Newcastle-Glasgow, Newcastle-Edinburgh, Newcastle-Liverpool, Newcastle-Manchester, Newcastle-Birmingham and Newcastle-Middlesbrough (two lines), Newcastle-Stockton, Newcastle-Darlington and Newcastle-Durham. Arrangements are being made to place the trunk lines between Newcastle and North Shields, South Shield and Sunderland underground.

Persia.—In a recent report on the trade of Persia, the British Consul at Kerman states that the past year saw the completion of the Central Persia telegraph line and the sending of the first through message from Persia to India. The work was completed on March 13th, 1907, and experimental working was successfully carried out from Teheran to Karachi, *vid* Quetta, inaugurating the much-required alternative route to relieve the congestion on the Persian Gulf cables. The line is what is technically called a "heavy" one, and carries three wires. Dahan-i-Baghi was found to be a most suitable place for a telegraph station, having good water and sufficient land for cultivation to grow provisions for the staff, and Mr. King Wood proposes to rename it "Hamilton," after the officer who first discovered it, and to transfer the station from its present unsuitable site at Hasartabad-Sipi. The alignment is slightly further to the north and longer than that at first proposed, but the fact that Mr. King Wood only had to do a little blasting at two passes, and that he constructed a road suitable for wheels is proof that the alignment is an excellent one. Mr. King Wood reports that travellers were already beginning to use the route before he returned from making it, and he thinks that when rest houses and halting places are established, it will be more and more utilised. Formerly, travellers had to procure a guide before attempting to cross the desert, and as these, like everything else in Persia, were very few and uncertain, long delays were frequent; now, with the line as a guide, it is impossible to get lost, and there is no need for dependence on anyone. The route will become general for all traffic from Bunder Abbas and south-eastern Persia into Seistan. With the completion of this telegraph line, the only important project remaining is the connection by telegraph of Baru and Bunder Abbas, so putting Kerman and Bunder Abbas in direct communication. At present telegraphic communication between Kerman and Bunder Abbas is *vid* Yezd, Isfhan, Bushire, and thence by cable to Henjam and Bunder Abbas, or *vice versâ*, whilst the post takes from 18 to 25 days between the two towns.

Signalling to Trains in Motion.—The German State Railway authorities, as a result of the serious accidents which have taken place in recent years in consequence of locomotive drivers having passed the stop signals, are now making arrangements on the railway between Berlin and Stettin for a series of experiments with wireless telegraphy, with the object of informing the drivers on the cabs whether they are approaching a signal. It appears that all known methods of acquainting the drivers with the position of the signals in dark and gloomy weather have been taken into consideration, and the following proposals have beenmade:—(1) Application of light for transmission such as by the increase of the signal light, repetition of the signal light and visible landmarks; (2) audible signals, such as detonators, bell signals, sirens, whistles and horns, and audible landmarks; (3) audible and visible signals, such as detonators producing a lighting effect; (4) signal transmission to the locomotive, as by mechanical or electrical power, magnetic transmission and transmission by means of electric waves; and (5) contrivances which only intimate the locality of the signal to the locomotive driver, but not the position of the signal arm. It is stated that electrically-operated horns have already been experimentally introduced on many railway sections, and the results have been so favourable that a large number is being applied to signals, so as to give drivers warning of the position of the signals. The horns are similar to those used on motor-cars, and two or three horns are to be provided for each signal, and arranged at intervals of 100 metres, on posts 3 metres high at the side of the tracks.

Telegraphic Interruptions and Repairs:—

Cables.	Interrupted.	Repaired.
Cayenne-Pinheiro	Aug. 13, 1902 ..	..
Curacao-Coro	Closed.. .. .. .. Jan. 12, 1906 ..	..
Curacao-La Guayra		
Curacao-Maracaibo		
Reissa-Issa and Reissa-Yemani (Yemen) ..	Oct. 22, 1902 ..	..
Tarifa-Tangier	Jan. 18, 1904 ..	..
Port Arthur-Chifu (Closed)	Mar. 9, 1904 ..	..
Garachico-Santa Cruz	July 12, 1906 ..	..
Las Palmas-Arecife	Aug. 18, 1906 ..	..
Trinidad-Demerara	July 8, 1907 ..	..
Burwick-Thorsham	July 8, 1907 ..	..
Landlines.		
Puerto-Barrios	Aug. 2, 1902 ..	..

The Great Northern Telegraph Co.'s cable between the Faroe Islands and the Shetlands is broken. A cable steamer was expected to leave Copenhagen for the Shetlands on Wednesday.

Tramway Telephones as Fire Alarms.—Arrangements have been made between the Watch Committee and the Tramway Committee of the Birmingham City Council, as a result of which the public may now make use of all the telephone boxes on the tramway standards for the purpose of summoning the Fire Brigade, or of obtaining assistance in the event of accidents or other emergencies. There are already 100 tramway telephone boxes available. Communication can be established at any hour of the day or night.—*Birmingham Daily Post.*

Underground Trunk Wires.—The Postmaster-General has decided to commence work from Newcastle on the extension of the underground telegraph line to connect Leeds with Newcastle.

CONTRACTORS' COLUMN.

Openings for New Business.

ABERDARE.—Villa at Llwydcoed for E. Moses. J. Ll. Smith, M.S.A., Aberdare, architect.

ABERDEEN.—Telephone exchange in Bon-Accord Street (£10,000).

ABERGELE (Llanfairtalhaiarn).—Extension of public schools (£1,560). Robert Evans & Sons, builders, Old Colwyn.

ACCRINGTON.—Extensions to Victoria Mill for W. M. Worsley, at Baxenden.

ACKWORTH (Near Pontefract).—County council school. J. Vickers Edwards.

ACTON PARK ESTATE.—Ten houses of first-class character in First Avenue. F. Wallis, builder, 22, Loveday Road, Ealing.

ACTON VALE.—Seven houses on west side of Larden Road (wiring for E.L. intended). G. A. Gale, builder, The Broadway, Walham Green.

ALFRISTON (Sussex).—New public schools and house (£2,911). Hockley and Co., builders, Ship Street Chambers, Brighton.

BARDNEY.—Wesleyan chapel. W. Mortimer & Son, Lincoln, architects.

BELFAST.—New factory for the Belfast Mineral Water Co. in York Road. W. J. Moore, 35, Royal Avenue, Belfast, architect.

Roman Catholic Cathedral in contemplation.

New children's infirmary about to be built at a cost of £8,457. Young & Mackenzie, Belfast, architects; Willliam Dowling, builder.

BISHOPBRIGGS.—Two villas for J. S. Campbell in Kenmure Avenue.

BLACKBURN (Great Harwood).—New Co-operative Stores (£2,000). F. J. Parkinson, architect, 9, Richmond Terrace, Blackburn.

(Great Harwood).—Extension of Windsor Road schools. F. J. Parkinson, architect, 9, Richmond Terrace, Blackburn.

BOLTON (Horwich).—Extensions to Victoria Mill for Messrs. W. & T. Taylor.

BOURNEMOUTH.—Block of shops and houses. C. H. Belbin, Bournemouth.

BRIERFIELD.—New school. Architect, Mr. Littler, Preston.

BRISTOL.—Engine and boiler-houses, accumulator tower, &c., at the graving dock. John Aird & Co., builders, London.

(Ashley Hill).—Public schools to accommodate 1,000 children, to be erected by the T.C.

BURNLEY.—New baths. Mr. Pickles, borough surveyor.

BYREMOOR.—E.L. to be installed at the church. Rev. J. A. Wilson, Byremoor, Rowland's Gill Station.

CAMBORNE.—Alterations to business premises for T. Moore & Son. S. Hill, Green Lane, Redruth, architect.

CASTLE EDEN (Co. Durham).—New Police Court, &c., for the County Council. W. Crozier, County Surveyor, Shire Hall, Durham.

CLOWN.—New Primitive Methodist Church.

COLCHESTER.—Rebuilding St. Giles' Church. J. Dorey & Co., builders Brentford, W.

CRAWCROOK.—Primitive Methodist Church (£1,650).

CROYDON.—Mains to be extended to supply 186 houses (2,620 lamps) at Pollard's Hill East, Norbury, and Cheyne Walk and Carlisle Road, Addiscombe.

DARLINGTON.—Shops and sheds at Albert Hill Wire Works. J. H. Roberts, Darlington.

DUKINFIELD.—Cabinet works, shops, &c, F. W. Uttley, Dukinfield.

New carriage works for the Great Central Railway Co. Mellowes and Co., Ltd., contractors, Corporation Street, Sheffield.

DUNDEE.—Motor-house for A. S. Henderson, Glamis Road.

Additions to Manse for Hilltown U.F. church at Mains Loan.

Additions to Central Police Buildings. Mr. Thomson, City engineer.

EAST HAM.—Stable and ambulance house at the Isolation Hospital, Roman Road. Apply A. H. Campbell, borough engineer, Town Hall.

Addition to Church of St. Edmund's. J. and J. P. Cutts, 14, Southampton Street, Strand, architects.

ECCLES.—Warehouses, stables and slaughter-houses for the Co-operative Society. T. Moore & Sons, Monton Road, Eccles, builders.

Extensions to engineering works at Peel Green, for Messrs. Gardner and Sons.

Enlargements to Messrs. Browett & Lindley's Works at Peel Green.

Extensions to works for the Eccles Rubber Co. in Monton Road.

EDZELL.—New Convalescent Home in connection with Montrose Infirmary (£2,200).

FOLKESTONE.—Two semi-detached houses in Grimston Gardens South. W. White, owner and builder; A. Bromley, architect.

(Cheriton).—New Baptist Church. E. E. Moody, Broadstairs.

Wesleyan Church (Surrender Road). J. Kingmill, architect, Folkestone.

Detached residence for Mrs. M. Bennett. A. Bromley, architect, Cheriton Place, Folkestone.

FORDINGBRIDGE (Hants).—Mission Church at Sandle Heath.

GRANTHAM.—Power house, &c. R. Hornsby & Sons, Ltd., engineers, Grantham.

GRAYS (East Thurrock).—New public schools. C. M. Shiner, architect, 110, Hamilton House, Bishopsgate Street Without, London, E.C.

HANLEY (Northwood).—Mission Church. W. A. Baynes, architect, Fountain Square, Hanley.

HARROGATE.—New Church Starbeck (£6,000).

HAVERFORDWEST.—Market house (£3,000).

HAWICK, N.B.—Proposed extension of Wilton Parish Church (£4,000).

HEREFORD.—Important extensions to the Spread Eagle Hotel. Groome and Bettington, architects, Palace Chambers, Hereford.

HOLLINGWORTH.—Council School (accommodate 600). C. T. Adshead, Leinster Chambers, St. Ann's Square, Manchester, architect.

HULL.—Town Hall to be extended by the T.C. (£40,000).

HULL (Hornsea).—Convalescent home (£4,000). W. H. Bingley, architect.

HUNTLY (Aberdeenshire).—Enlargement of school and teachers' house. Mr. Kelly, architect, Aberdeen.

KEIGHLEY.—Fireproof mill and boiler house, at Beck's Road. Moore and Crabtree, York Chambers, Keighley, architects.

LEEDS.—Extension of shoe works at Burmantofts. W. M. Cogqiel, architect, 4, Airdale Terrace, Stourton, Hunslet, Leeds.

LEIGHTON BUZZARD.—Extensive works for Hief, Beavon & Co. Cook and Son, builders.

LINCOLN (Bracebridge).—New church. C. Hodgson Fowler, architect, Durham; H. S. & W. Close, builders, Lincoln.

LISBURN (Ireland).—William Foote Memorial Schools in Seymour Street. Rev. A. Egan, Methodist Manse, Lisburn.

LONDON, W.C.—Theatre abutting upon Wardour Street, Shaftesbury Avenue, and Upper Rupert Street, Strand. W. G. R. Sprague, 10, Jermyn Street, W., architect.

(Wandsworth and Fulham).—Shops. C. Botterill, 583, Fulham Road, S.W., surveyor.

(Victoria Street, S.W.).—Shop. R. G. Hammond, 16, Essex Street, Strand, architect.

(Greenwich).—Buildings on site of 112, 114, 116, Blackheath Road for Harrison, Gibson & Co., High Road, Ilford, house furnishers.

(Battersea).—Electrical installation in Longhedge Works, Silverthorne Road, for South-Eastern and Chatham Railway Co.

(Battersea).—Station buildings at St. John's Hill for London, Brighton and South Coast Railway Co.

(Battersea).—Building on site of 115—117, New Road, with Mission Hall at rear. W. Dewes, 4, Bloomsbury Place, W.C., architect.

(Haggerston).—Buildings in Kingsland Road. J. Ferrer, 2, Coleman Street, E.C., architect.

(Islington).—Chapel and school building in Tollington Park. E. D. Hoyland, 2, Wallbrook, E.C., architect.

(Kensington).—Five shops in Earl's Court Road. C. R. Guy Hall, 1, Alma Terrace, Allen Street, Kensington, architect.

(Ealing).—Shops. Ford & Walton, 1, West End Lane, Kilburn, builders.

(Strand).—Alterations, &c., to W. H. Smith & Son's premises. W. H. T. Kelland, 43, Manor Road, Stoke Newington, builder.

E.C.—Offices on site of 36, 37, 38, New Broad Street, and 22, 23, Broad Street Avenue. Wm. Johnson & Co., Wandsworth Common, S.W., builders.

(Stratford, E.).—Business premises for Boardman's, Ltd.

(Kensington).—Flats in St. George's Place. P. Hoffmann, 152, Palmerston House, Old Broad Street, E.C., architect.

(Lewisham).—174 houses. H. and G. Taylor, Lingards Road, S.E., builders.

(Kentish Town).—Rebuilding schools (£3,000). Rev. B. Saunders-Lloyd, vicar, Holy Trinity Church, Haverstock Hill, N.W.

(Camberwell).—Two blocks of flats. R. Saunders, 62, Bishopsgate Street Within, E.C., architect.

(Bermondsey).—Buildings on site of Nos. 216—256 (inclusive), Old Kent Road. J. M. Lester, 9, Hindes Road, Harrow, architect.

(Greenwich).—Addition to the Seamen's Hospital. T. Rider & Son, 181, Union Street, Boro', S.E., builders.

(Hammersmith).—Extensions of premises in Bloemfontein Road for R. B. Grantham & Son, 23, Northumberland Avenue, W.C.

(Dartford).—Buildings in connection with Joyce Green Hospital (£4,713). Treadwell and Martin, 27—33, Charing Cross Road, architects; A. N. Coles, Plymouth and Chelsea, builders.

(Hammersmith).—Store in connection with King's Theatre for J. B. Mulholland, 73, Upper Richmond Road, Putney.

(Mile End, E.).—Execution of work at the various homes in the Old Town, and the Workhouse in Mile End Road. W. Thacker, Clerk to the Guardians, Bancroft Road, Mile End Road, E.

(Hoxton).—Additional accommodation at L.C.C. school (£950). T. J. Bailey, architect to L.C.C. Education Committee, Spring Gardens, S.W.

LUTON (Beds.).—Extensive works for Chas. Clay & Sons, electrically equipped (£5,200). J. R. Brown & Sons, architects, 9, Castle Street, Luton; C. Herbert White, builder, 72, Dunstable Road, Luton.

MERTHYR TYDFIL (Dowlais).—Public schools to be built by the T.C. (£5,000).

NANTWICH.—New Primitive Methodist Church. R. Matthews, architect, Nantwich; Mr. Read, builder, Hospital Street, Nantwich.

NELSON.—Fire station to be built by the T.C. (£3,500).

NEWARK (Notts).—Public schools (£7,110). Wm. Smith, builder, Newark.

NEWCASTLE-UNDER-LYME (Staffs.).—Motor depôt and garage for H. K. Hales. H. Burgess, architect, Anchor Chambers, Stafford Street, Longton.

NORBURY.—Large house (electric light to be installed). Gathercole Bros., Norbury, builders.

NORTHAMPTON.—Important extensions of manufacturing premises by the Co-operative Wholesale Society.

OLDHAM.—New cotton mill at Shaw for the Trent Mill Co. Plans in preparation.

New mill at Chadderton to be erected. Contractors for spinning machinery, Platt Bros. & Co., Ltd.

PONTLOTTYN (Glam.).—Business premises in Merchant Street for A. T. Fine and Co. James & Morgan, architects, Charles Street Chambers, Cardiff.

Alterations and additions to premises in The Square for J. Price. James & Morgan, architects, Charles Street Chambers, Cardiff.

(*Continued on page* 64.)

THE STRATFORD POWER STATION OF THE GREAT EASTERN RAILWAY.

To anyone who cares to follow the vicissitudes of electrical design during the past decade, most instructive comparisons can be made between the modern turbo-generating plant recently set to work by the Great Eastern Railway Co., at Stratford, and described in this issue, and the reciprocating plant at Norton Folgate, which it in part displaces, and which the interested reader will find illustrated and described in the Electrical Review of September 18th, 1896.

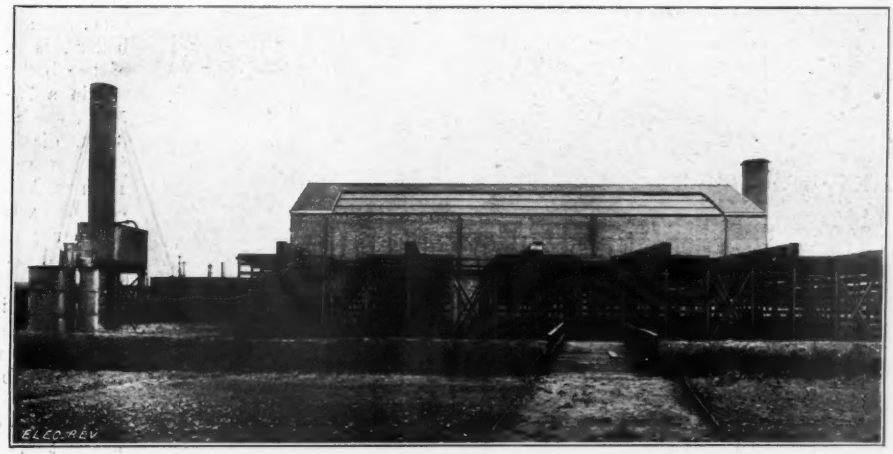


Fig. 1.—Exterior of the Stratford Power Station of the Great Eastern Railway Co., showing the Water-Cooling and Softening Plant.

In its way, the latter plant constitutes an historical landmark in the path of electrical progress, and its supersession is a regrettable, but necessary corollary of that progress.

Its scope is, of course, much greater than that of the older plant in Bishopsgate, as it will, in addition to taking over the load of the latter—principally derived from Liverpool Street Station and Hotel, and Bishopsgate Street goods yard—also supply energy to the company's suburban stations to the number of over 20, the Fenchurch Street terminus, the company's locomotive works at Stratford, printing works at Canning Town, and wagon works at Temple Mills. A large proportion of the machinery

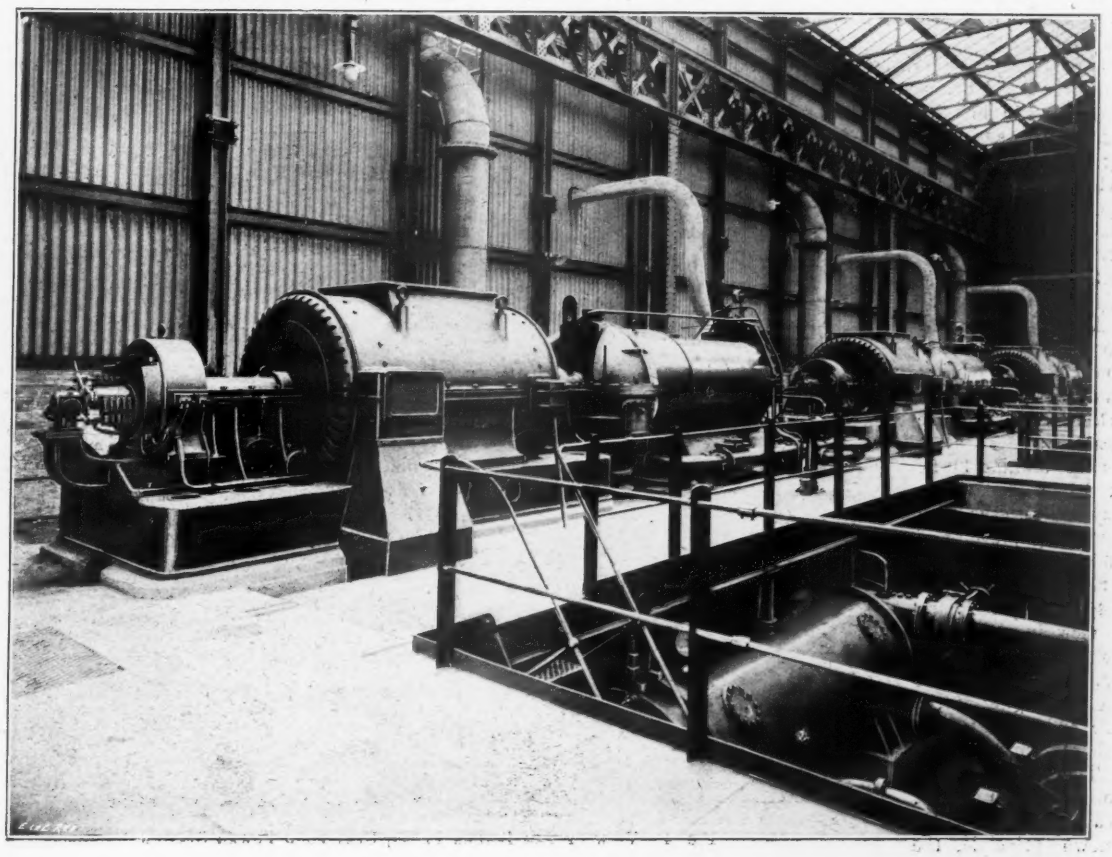


Fig. 2.—General View of the Parsons Turbo-Alternating Plant.

The Stratford power station has been laid out under the supervision of Mr. John Wilson, chief engineer, by Mr. H. W. Firth, who has since been appointed electrical engineer to the Great Eastern Railway.

employed in the above works, goods depôts and the hotel, will shortly be electrically-driven from the new plant, which augurs well for its commercial success.

We would add that the Norton Folgate plant had a load factor of some 40 per cent., and it is expected that the new plant at Stratford, with a quadrupled output, will be equally well-favoured.

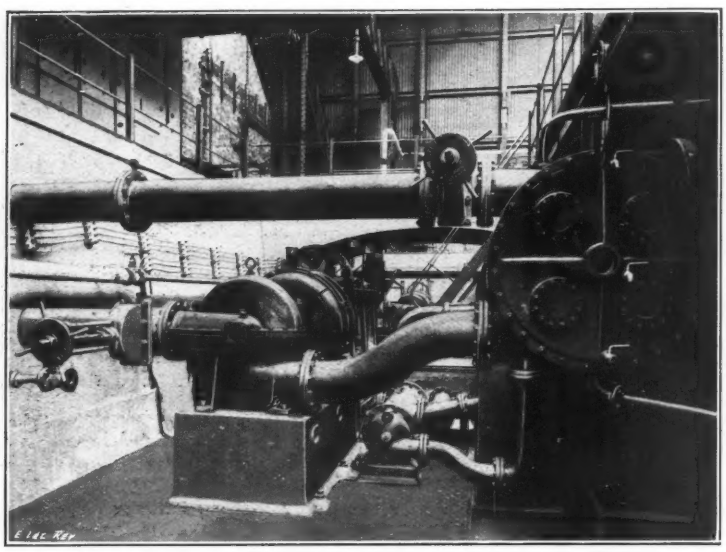


Fig. 3.—Surface-Condensing Plant for 1,000-kw. Unit.

This plant, both in arrangement and housing, conforms admirably to the requirements of a power station pure and simple.

The buildings, comprising an engine and boiler house only, are steel-framed structures sheathed in corrugated iron and resting on a floating concrete slab, stiffened by layers of expanded metal; a form of construction to some extent necessitated by the exigencies of the site.

A coal siding runs alongside the boiler house, fuel being dumped by hand on to the firing floor. The steam-raising plant consists of nine 30 ft. × 8 ft. 6 in. Galloway boilers, each with a working pressure of 160 lb. per sq. in., and a rated evaporation of 8,400 lb. per hour; a view in the boiler house is shown in fig. 4, wherein the special flanging at the flue ends, referred to below, is visible.

The boilers are constructed on Messrs. Galloway's well-known principle, the two-grate flues merging into a common flue provided with 30 cross-tubes. The flue openings in the boiler front are flanged outwards instead of, as is more usual, inwards, this construction, of course, allowing of full inspection of the riveting; further, the end rivets of all the gusset stays on the front plate (*i.e.*, at the point where the stay would probably tear away), are drilled centrally for three-quarters of their length, the inner ends being solid and provided with nuts screwed on. Any fracture of such a rivet below the nut would result in steam blowing through the front plate and warning the stoker; the arrangement is, of course, well known in locomotive work.

A tubular superheater is inserted in the down-take behind each boiler, with a view to obtaining about 100° F. working superheat; the main flue, behind the boilers, is extended through both ends of the boiler house, terminating at one end in a 75-ft, and at the other in a 50-ft. stack, both being of steel, 8 ft. 6 in. diameter, and worked in conjunction with induced draught plant. Both stacks are lined some 40 ft., and can be extended to 100 ft. in height when required. The taller stack at one end is (induced draught plant, notwithstanding) for the purpose of giving the increased draught required by a 480-tube Green economiser, which is installed at that end. This economiser can be extended to 720 tubes when required, and the scraper gear is electrically-driven. The induced draught plant consists of four Buffalo Forge Co.'s fans, each coupled to a 17½ B.H.P. B.T.-H. three-phase motor, and disposed two per stack.

The whole of the steam and feed piping is of solid drawn steel with welded flanges to the Engineering Standards specification, and was supplied by Messrs. Spencer, of Wednesbury. The lagging throughout is of sectional magnesia. One 8-in. header, divided into three sections by two expansion bends and sectional valves, is situated behind the boilers and superheaters; three 6-in. boiler branches enter and one 6-in. turbine branch leads from each section, the arrangement forming a unit system with three boilers and a turbine per unit. Each boiler is fitted with two double-lever safety valves and with Hopkinson steam and water fittings; the steam and feed valves were supplied by Messrs. Noakes, of Whitechapel, and the steam bends to the superheaters and header are all interchangeable.

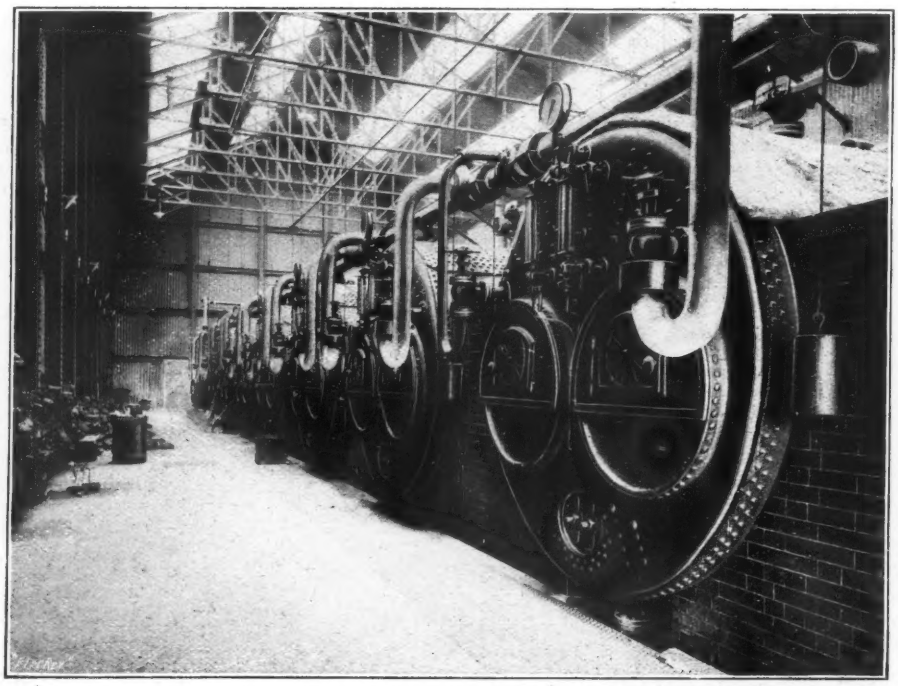


Fig. 4.—View of the Boiler Plant, Stratford Power Station

The water, both for feed and condensing purposes, is obtained from a deep well situated by the cooling towers.

For boiler feeding the water is treated in a Stanhope water softener, removed from the Norton Folgate station, and having a capacity of 2,500 gallons per hour; the feed pumps are of the Hall vertical compound type, one of 6,000 gallons per hour capacity being installed at each end of the condenser pit in the engine room, and arranged to feed either through the economiser or direct to the boilers.

Turning to the generating plant, this comprises three 1,000 KW. turbo-alternators, running at 1,500 R.P.M., and delivering three-phase current at 6,600 volts pressure and 50 cycles. Both turbines and alternators were supplied by Messrs. C. A. Parsons & Co.; the alternators being star-connected with neutrals earthed through suitable resistances, and conforming in design to the firm's latest practice, as described in the ELECTRICAL REVIEW of June 21st last.

In each case a small 50—60-volt two-pole exciter is mounted on an extension of the alternator shaft.

The turbine units are arranged longitudinally down one side of the engine room, as shown in fig. 2, their respective condensing plants being in an open pit in the centre of the building, with the H.T. and auxiliary switchgear on the far side. Each condensing plant includes a Carrick and Wardale surface condenser, fitted with Parsons' vacuum augmenter and three-throw Parsons compound air pumps, gear-driven from a 70-H.P. B.T.-H. 390-volt three-phase motor, to the other side of which is attached an Allen centrifugal circulating pump. Each turbine is (as usual) arranged to exhaust, in emergency, through a water-sealed automatic valve to atmosphere. The arrangement of the condensing plant for one unit is shown in fig. 3.

The circulating pumps draw from the tank under a Balke cooling tower, and deliver through the condensers to the top of the tower again. Fig. 1, which shows the exterior of the station, and also gives an idea of the water-cooling towers and Stanhope softening plant.

Reference has been made to the deep well water supply; in connection with this a Reavell air compressor, driven by a 22-H.P. B.T.-H. three-phase motor and two Westing-

FIG. 5.—LAYING H.T. FEEDERS ON THE GREAT EASTERN RAILWAY.

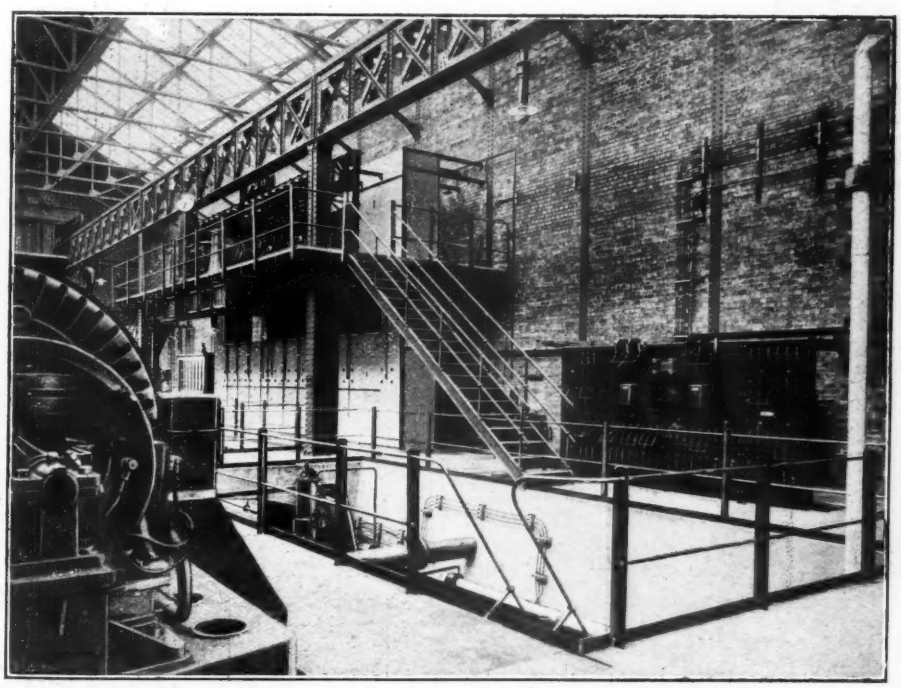


FIG. 6.—SHOWING THE H.T. AND AUXILIARY SWITCHBOARDS, &C.

house steam driven air pumps, are installed in the engine room for operating the air lift.

It will be gathered from the foregoing that the plant is intended to supply only three-phase current at high pressure, and the main switchgear, supplied by the British Thomson-Houston Co., is designed to this end. Roughly, this switchgear comprises an upper and lower row of oil switches, linked together by ring bus-bars; the switch panels are situated on a level with the upper row of oil switches, and the operating gallery overlooks the whole of the running plant as shown in fig. 6. The ring bus-bars are divided into six sections by non-automatic oil switches, the middle upper and lower sections are reserved to generator and works switches. Each sub-station is practically supplied through duplicate feeders, one connected to a bus-bar section in the upper row, and one to a corresponding section in the lower row, thus facilitating a division of the load between lighting and power services, or otherwise as desired.

It may also be noted that except in two cases, isolating links between oil switches and bus-bars are done away with, as sections may be shut down without interfering with the supply.

A view of the operating board is shown in fig. 7; this consists of 24 panels with the usual B.T.-H. pattern hand-operated oil switches and instruments, divided into 12 feeder, four generator, six section, and two works supply panels.

It will be noticed that the oil switch handles are irregularly fixed, the upper ones operating the upper oil switches and the lower ones those on the ground floor.

The generators are provided with triple-pole reverse-current relays of the differential type, while all feeders have direct-acting trip gear supplied from series transformers, with secondary fuses in parallel with the trip coils to give the time-limit effect. These avoid the complications of intermediate time-limit relays between the current transformers and the trip gear.

Each feeder is equipped with one ammeter with a jack, by means of which it can be inserted in the secondary of the current transformer in any one of the three phases. Each generator is equipped with one ammeter, one voltmeter and one indicating wattmeter, provided with a switch, such that it can be used at will to measure the lagging or leading component of the machine output instead of the energy component. Recording watt-hour meters are also provided for the generators, and sector type, illuminated dial voltmeters for the bus-bars. Synchronising is accomplished by duplicate synchronisers of the revolving dial type, one having double dials 18 in. diameter, swivelled, so that one of them can be turned towards any part of the engine room for the benefit of the turbine attendants.

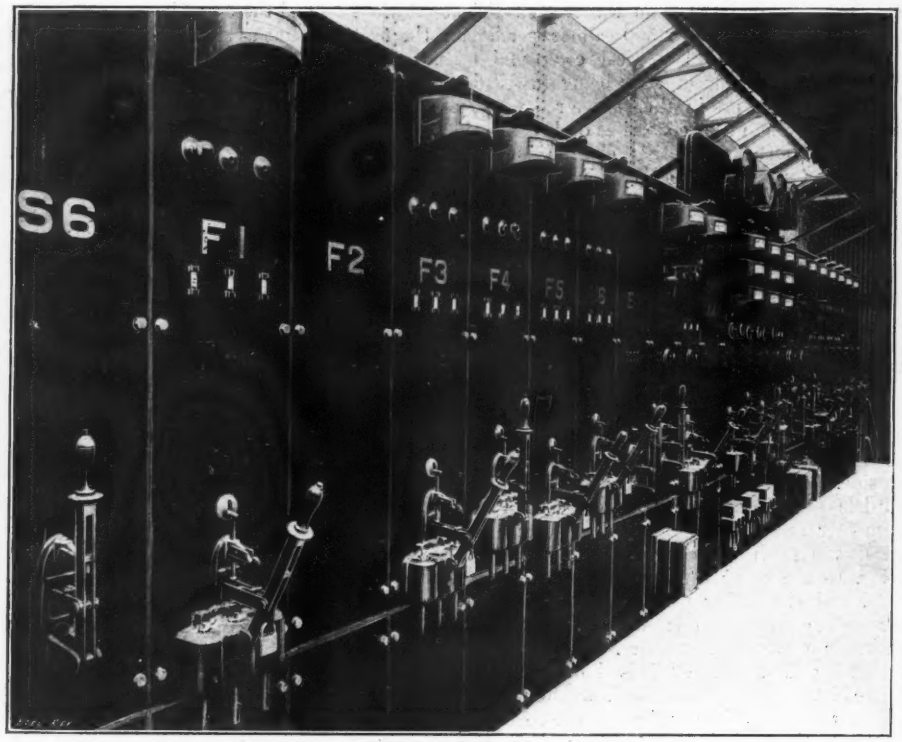


FIG. 7.—VIEW OF THE H.T. SWITCH PANELS.

One three-phase potential transformer per generator supplies all synchronising, watt-hour meter, relay and other potential circuits; and three current transformers per generator or feeder—one in each phase—supply all current instruments and automatic gear.

A Tirrill regulator (shown together with a synchronising dial in fig. 9) working on the exciter fields, automatically regulates the pressure sufficiently for lighting purposes; this is mounted on the switch operator's platform, together with the generator field rheostat pedestals.

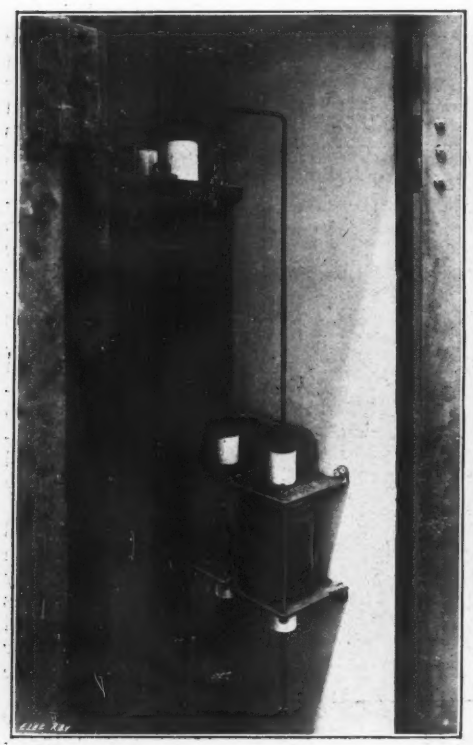


FIG. 8.—H.T. OIL SWITCH CELL, SHOWING CURRENT AND POTENTIAL TRANSFORMERS.

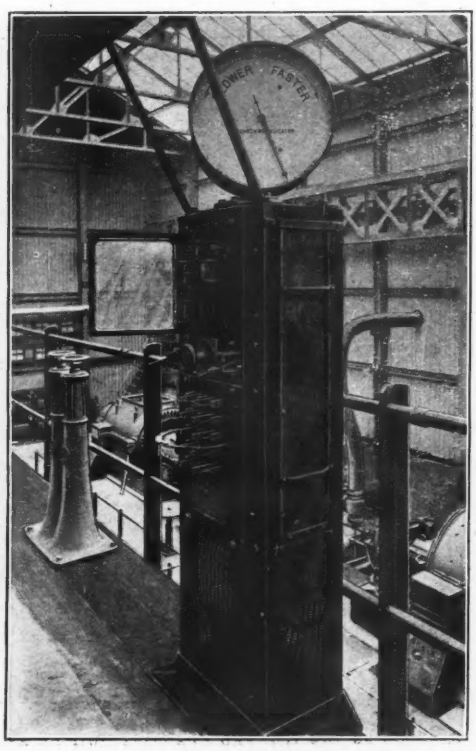


FIG. 9.—THE TIRRILL REGULATOR AND SYNCHRONISING GEAR ON THE H.T. SWITCH GALLERY.

The oil switches and bus-bars are located in a two-storied cellular concrete structure built up from the engine room floor level.

All the high pressure connections are of bare copper rod, and all connections are uniformly coloured red, blue and yellow to distinguish the phases; the exciter field rheostats are fixed behind the generator panels, and the main field rheostats are suspended below the switch gallery.

The generator neutrals are connected through links to a neutral bus-bar, which is earthed through a cast-iron grid and mica resistance, having a value of 14·2 ohms., and capable of carrying the full load of about 250 amperes at about 4,000 volts, which would be impressed upon it in case of a heavy fault to earth. This limits any earth current, sufficiently for the satisfactory operation of the discriminating devices which control the circuits.

The works distribution board, situated on the engine-room floor level, is also shown in fig. 6; this is supplied from the main board through two 150-KW. Berry oil-cooled transformers, each with a step-down ratio of 6,000/390 volts, and controls the auxiliary circuits to the pump and economiser motors, &c., incandescent and arc lighting.

The turbine and condensing plant is served by a Morris and Bastert 20-ton hand travelling crane, provided with two 10-ton lifting crabs, which spans a portion of the engine house.

The H.T. three-phase mains, in duplicate, extend from the generating station at Stratford to Bishopsgate Street, Fen-

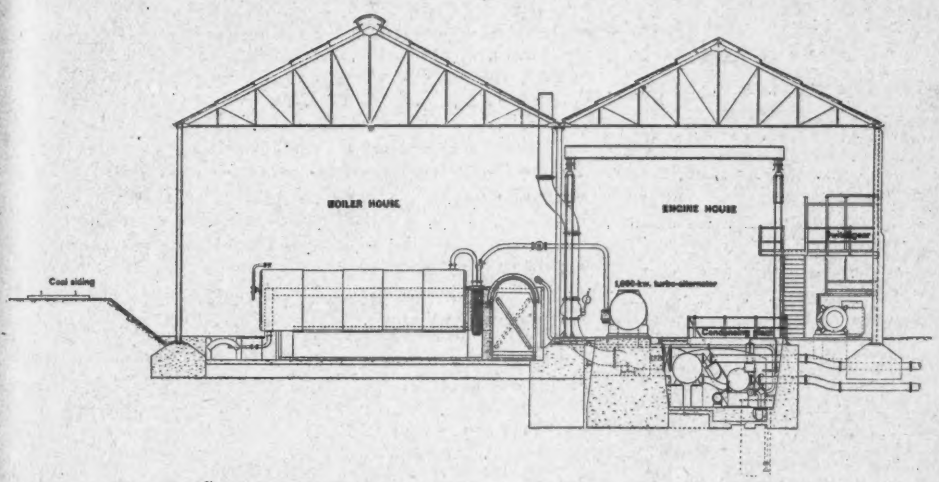


FIG. 10.—CROSS-SECTION THROUGH THE STRATFORD POWER STATION, G.E. RLY. CO.

church Street, Goodmayes, Temple Mills, Wood Street, Leytonstone, and to the company's works and railway station near by, and were supplied and laid by Messrs. Henley's Telegraph Works Co.

The cables, comprising some 60,000 yds. in all, are of four different sizes equivalent in sectional area to 19/14, 19/18, 7/18 and 7/19, and are three-core, paper-insulated, lead-covered, and copper sheathed.

For the most part the cables are laid solid in wood troughing, and covered with tiles, but in confined places, such as over viaducts and bridges, they are laid in square cast-iron troughs, on a layer of felt, and bracketed to the walls.

The jointing up of the manufactured lengths was done by means of the lead sleeve joint; the T-joints and trifurcating terminal ends are made in special high-tension cast-iron boxes of Messrs. Henley's standard design.

As the use of electricity on a wholesale scale is somewhat new to the Great Eastern Railway Co., considerable interest attaches to the methods adopted by them in their various works and stations, which the following brief notes will tend to explain. The new plant is expected to have an output of some 10 million units eventually, a considerable portion of which may be taken by the adjoining locomotive works, which will nominally be supplied in bulk.

Three similar sub-stations have been put down in these works, two being supplied by independent feeders, and all three interconnected with a view to ensuring continuity of supply.

Each sub-station is divided into two compartments, one containing two Berry oil-cooled transformers and the necessary switchgear, and the other a low pressure power and lighting distribution board supervised by the locomotive department.

The switchgear in the transformer chamber is of B.T.-H. design, and includes two transformer panels, one incoming and one outgoing feeder panel, and a L.T. transformer panel fitted with watt-hour meters. Bare strips connect the rear of the latter panel through the wall to the L.T. distribution board in the adjoining chamber. The H.T. bus-bars are sectioned, a transformer and feeder being on either side of the switch; the oil switches are of the standard hand-operated type, those for the transforming and incoming feeder being fitted with overload trips, while the feeder switch has in addition a reverse current relay; and time-limit fuses are employed generally.

The H.T. leads are all lead-covered and drawn into ducts; the transformer L.T. leads are cleated to the wall.

The works distribution board is also fitted with an independent meter, and controls 12 circuits, the pressures being 440 volts for power, or 250 volts (between each phase and neutral) for lighting work. It is expected that some 1,000 KW. will eventually be supplied in these works.

In other transformer stations where the supply is directly under the control of the power department, both H.T. and L.T. distributing switchgear is installed in one chamber.

At the local passenger stations, where the lighting is now being carried out electrically, small transformer chambers have been constructed.

Taking the stations between Stratford and Liverpool Street as being typical of the remainder, these are normally fed by a looped-in feeder running to Norton Folgate (Bishopsgate); but in emergency they can also be fed backwards from Norton Folgate through the duplicate direct-feeder running to that point.

In the platform transformer chambers the incoming and outgoing feeders are led into trifurcating boxes, these latter being of the standard horizontal type used throughout, and laid side by side; the three terminals are in each case linked to three rubber-covered cables connecting to a plug switch-fuse fitting arranged above the dividing boxes.

The fuses are of the so-called "bomb" type, and the fitting is arranged so that it is necessary to withdraw the plug—leaving the fuse terminals dead—before replacing a fuse. From the switch-fuse fitting asbestos-covered cables lead to a 10-KW. Berry transformer, the L.T. leads from which pass through a three-pole switch and fuse panel, and outside the chamber to double-pole fuse distribution boards on the platforms. The station lighting is uniformly run on 220 volts, between phase and neutral. The platform lighting is carried out with bare overhead wires suspended from insulators on the roof trusses. It may be mentioned that the Foster midget arc lamp has been adopted on certain stations, and that at the larger premises at Stratford Junction the Foster flame arc is being used.

We have previously referred to Norton Folgate and the historical plant there installed; this plant supplies nearly 400 arc lamps in the neighbourhood of Liverpool and Bishopsgate Street Stations in addition to hotel lighting and lift motors, &c., and such power as is needed in the goods depôts.

As this portion of the supply is on the direct-current system at 220 volts pressure, three 300-KW. Peebles-La Cour motor-converters and the necessary switchgear are being installed in place of some of the existing steam plant. The H.T. switchgear here as elsewhere is of B.T.-H. standard design, and includes three generator and two feeder panels, fitted with oil switches and overload relays, time-limit fuses, &c. With the introduction of new plant, the opportunity has been taken to install a new L.T. board, which includes some 16 panels, of standard B.T.-H. design.

The new scheme has throughout been carried out on the simplest possible lines, duplication and superfluous auxiliaries being conspicuous by their absence. Bare wiring has been employed in many instances, and one can only regret that it does not play a more prominent part in connection with the main transmissions, which are, naturally, wholly on the company's property. Mr. H. W. Firth, electrical engineer to the Great Eastern Railway Co., has been responsible for the design and carrying out of the whole of the work, being assisted by Mr. D. James and Mr. F. Usher, his chief assistants, Mr. W. Watson, who has been resident engineer at the power house, and Mr. C. C. Skeates, distributing engineer, and our thanks are due to these gentlemen for their assistance in preparing this article.

CONTRACTORS' COLUMN.

(*Continued from page* 58.)

PONTYPRIDD (Coedpenmaen).—New church. Evans, Williams, and Evans, architects, Post Office Chambers, Pontypridd.

PORTH (Rhondda).—Erection of Tynewydd Hotel for F. Morgan. J. T. Jenkins, architect, Porth.

PRESTOLEE (Lancs.).—New Council school. H. Littler, county architect, Preston.

RAWTENSTALL (Waterfoot).—Technical institute to be erected by Lancs. C.C. (£26,000).

RHOS (near Wrexham).—New chapel, school, &c. Walter Williams, secretary, Fynnaut Road, Ponkey, Ruabon.

ROCHDALE (Whitworth).—Bleaching and dyeing works. Whitworth Bleaching and Finishing Co., Ltd., owners.

ROWDE (Wilts.)—Elementary school. A. J. Randell, Exchange Place, Devizes, architect.

ROYTON (Near Oldham).—New spinning mill for the Park and Sandy Lane Spinning Co., Royton.

RUABON.—Church, schools, &c. Edwin Hawkins, Church Street, Rhos, Ruabon.

RUGBY.—A second new theatre to be erected (£10,000). A. F. Cross, Rugby, owner.

ST. ALBANS.—Salvation Army Barracks (£5,000).

ST. IVES (Colne).—New public schools. County Surveyor, Huntingdon.

SELBY.—Restoration of Selby Abbey. J. O. Scott, architect, London.

STAFFORD.—Isolation hospital for the T.C. W. Blackshaw, Borough engineer, Borough Hall, Stafford.

STEPPS (N.B.).—Houses and shops for Dr. A. Ross, in Cumbernauld Road.

SWANSEA.—Elsteddfod pavilion lit by electricity. L. H. Woodhouse & Co., builders, Nottingham.

THURSO.—New public library.

TURRIFF.—Rebuilding of property in Castle Street for Kirk Session. W. L. Duncan, architect, Turriff.

WALKDEN (Manchester).—Place of worship. F. A. Ellis, Pendleton, architect. J. Ramsbottom, builder, Church Street, Pendleton.

Brickworks for Lord Ellesmere, at Ellenbrook. Write, Captain H. V. Hart Davis, Bridgewater offices, Walkden.

WILLESDEN.—Extensions to Messrs. Whiteley's dye works in Victoria Road. John Cash, 22, Surrey Street, Strand, W.C.

YNYSHIR (Rhondda).—Vestry, class-rooms, and minister's house for the Saron Congregational Church Building Committee. Apply to E. Thomas, 16, South Street, Ynyshir.

CONTRACTS OPEN and CLOSED.

OPEN.

Argentine.—The *Review of the River Plate* says that the Argentine Foreign Office has remitted to the Legation at Paris a set of estimates for the purchase of 80 kilometres of telegraph wire, which is required in the construction of a telegraph line to Chile *vid* the Cordillera.

Beckenham.—July 22nd. Meters for the electricity department. See "Official Notices" July 5th.

Belgium.—July 27th. The municipal authorities of Ougrée, near Liège, are inviting tenders for the establishment of a central electric lighting station in the town. Particulars may be obtained for 25 francs from, and tenders are to be sent to, La Maison Communale, Ougrée.

Birmingham.—July 26th. Electrical pumping machinery (800 H.P.) for the Birmingham, Tame, and Rea District Drainage Board. See "Official Notices" to-day.

Brandon (Meadowfield).—Public electric lighting installation for the U.D.C. G. G. Donkin, surveyor, Langley Moor, Co. Durham.

Brighton.—July 15th. The Education Committee invite tenders for the installation of electric light at the Pelham Street Council School.

Bristol.—Electric two-ton capstans (10) and movable electric jib cranes for the Docks. W. W. Squire, Engineer, Cumberland Basin, Bristol.

Cardiff.—July 16th. New telephones and alteration of telephone service at Cardiff and Ely workhouses for the Cardiff Union. A. J. Harris, Clerk, Union Offices, Queen's Chambers, Cardiff.

Croydon.—Flame arc lamps, transformers for same, and lowering gear, for the Electricity Committee. See "Official Notices" to-day.

Devon.—July 12th. Electric lighting of Uffculme, Devon. Tenders to S. B. Sparkes, Coldharbour, Uffculme, Cullompton, Devon.

Germany.—July 22nd. The municipal authorities of Treysa, Hesse, are inviting tenders for the supply of the dynamos and accumulators required for the central electric lighting station.

Hobart (Tasmania).—August 14th. Telegraph and telephone material for the Deputy Postmaster-General. Specifications, &c., at the office of the Australian Commonwealth, 72, Victoria Street, S.W.

Leeds.—July 15th. The Sewerage Committee want tenders for a small combined electric lighting set, compound condensing engine and continuous current generator (45 B.H.P., 110 volts). Specification of engine and dynamo to accompany tenders. Particulars from G. A. Hart, sewerage engineer, Municipal Buildings.

L.C.C.—July 16th. 78 tramway feeder pillars and overhead equipment for Woolwich double track. See "Official Notices" June 28th.

Manchester.—Steam piping, superheaters, steam traps, &c., for Messrs. John Collier & Co. See "Official Notices" June 21st.

Perth (W.A.).—August 6th. Desiccating apparatus with motor-driven air-pump for telephone cable work for the Deputy Postmaster-General. Specifications at the Commonwealth Office, 72, Victoria Street, S.W.

Radcliffe.—July 20th. Low tension cable for the U.D.C. See "Official Notices" to-day.

Rochester.—July 22nd. Permanent way and overhead line for Corporation tramways. See "Official Notices" to-day.

Rotherham.—July 12th. Cable and meters for one year for the E.L. department. See "Official Notices" June 28th.

Spain.—August 12th. The Spanish Ministry of Public Works in Madrid is inviting tenders until August 12th for the concession for the construction and working of an electric tramway in the town of Valencia.

Spain.—Tenders have just been invited by the municipal authorities of Mollet (province of Barcelona) for the concession for the electric lighting of the town.

Stepney.—July 22nd. Testing switchboard, motor-generator and transformer, also distribution board and earthing panel for the electricity department. See "Official Notices" July 5th.

Sydney (N.S.W.).—August 14th. The Deputy Postmaster-General is inviting tenders for telegraph, telephone and electric light material.

Warrington.—July 16th. Erection of buildings for boiler plant extension for the electricity department. See "Official Notices" June 28th.

Wednesbury.—July 23rd. Balancer boosters and accumulators for electricity works extensions. See "Official Notices" July 5th.

West Riding (Yorks.).—July 22nd. (1) Two engines and dynamos, electric light installation (including wiring, fitting, lamps, &c.); (2) Electric bells, telephones, fire alarms and recording clocks; (3) Heating and ventilation; for the second portion of the main institution of Storthes Hall Asylum. Tenders to J. Vickers-Edwards, architect, County Hall, Wakefield.

Willesden.—July 22nd. Stoneware conduits for the U.D.C. See "Official Notices" to-day.

Wimbledon.—July 22nd. Edwards air pump equipment and voltmeters for the Corporation electricity department. See "Official Notices" to-day.

CLOSED.

Belfast.—At the meeting of the Electrical and Tramways Committee last Monday the tenders for the coal storage bunkers and electric crane came up for discussion. That of Messrs. J. and W. Stewart, Belfast, at £2,059, was accepted, subject to the approval of the L.G.B.

Croydon.—The Corporation has extended its contract with W. Cory & Son, Ltd., for the supply of coal to the generating station for a further eight months, at the present contract rates.

Glasgow.—Messrs. Bruce Peebles & Co., Ltd., have received from the Corporation an order for a 1,000-KW. Peebles-La Cour motor converter to operate on a 25-cycle circuit.

London.—For the wiring of the Old Kent Road Library, the tender of Cannon & Sons, London Road, S.E., at £241, has been accepted. The tenders ranged from £191 to £301.

Woolwich.—The B.C. has accepted the tender of Kaye, Son and Co. for coal for the Woolwich electricity works, and of W. Cory, Son & Co. for the supply to Plumstead electricity works.

The B.C. has accepted the tender of Messrs. Heathman & Co. for an arc lamp trimming ladder, at £20 2s. 6d.

E.C.—Mr. F. V. Slatter, of Fann Street, E.C., has secured the contract for stage lighting at the Central Club, Clerkenwell Road.

L.C.C.—The Highways Committee of the L.C.C. proposes to accept the tenders of the British Electric Transformer Co. and the

Electric Construction Co., amounting to £178 and £95, for the supply of a transformer and an additional motor at the New Cross sub-station and the New Cross repair depôt respectively. The tender of W. Cory & Son to deliver 75,000 tons of coal, at 14s. 5d. per ton, at the Greenwich station is also recommended for acceptance.

Newport (Mon.).—The Corporation has accepted the following tenders:—

General Electric Co., two alternators	£1,289
Electric Power Storage Co., battery	3,332
Lancashire Dynamo Co., boosters	1,109
W. A. Baker & Co. (Newport), extension of switchboard gallery	160
Alger & Sons (Newport), switchboards..	563

Portsmouth.—The E.L. Committee of the T.C. has accepted the tender of Messrs. Willans & Robinson for the supply of turbo-alternators, &c., at £5,553.

Messrs. Grossmith & Co, of Portsmouth, have secured the contract for installing the electric light at the King's Theatre, Albert Road.

Salford.—The T.C. has accepted the following tenders for supplies to the tramway and electricity departments:—

Tandem Smelting Syndicate.—Magnolia antifriction metal.
Lancaster & Tonge, Ltd., Malleable Steel Castings Co., R. Johnson, Clapham & Morris, Ltd.—Mechanical car accessories.
Bailey & Jones, Ltd.—Brake blocks.
Geo. Hill & Co.—Overhead equipment insulating materials, ears, frogs, pull-offs, &c.
United Asbestos Co.—Asbestos powder, corrugated brass joint rings, boiler gauge and sight feed glasses, &c.
W. T. Glover & Co.—Cable and cable accessories.
General Electric Co.—Continuous-current house meters, cut-outs, casing and capping, and steel-insulated screwed tubing.
Veritys, Ltd.—High and low-speed electric motors.
Ferranti, Ltd.—House meters.
W. T. Henley's Telegraph Works Co.—Rubber strip and black tarred tape.
Hall & Pickles.—Iron and steel bars, plates, &c.
Chas. Macintosh & Co.—Cables.

Stalybridge.—The Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board has accepted the following tenders for stores:—

Tinker, Shenton & Co.—Three boilers.
J. Carter & Sons.—Brake blocks.
Edison & Swan United Electric Light Co.—16 c.p. lamps.
Morton & Edwards.—Trolley wheels, bushed and graphite bushes.
Vacuum Oil Co.—Lubricating oil and maganesite paste.
Brooke & Sons.—Asbestos yarn, &c.
F. R. Smith & Co.—Cones.
F. Wild & Sons.—Cylinder oil.

Stockport.—The T.C. has accepted the tender of Mr. Bertram Thomas for the supply of switchboard gear, switches, at £105, and that of Eckstein, Heap & Co., for Elliott's amperemeters, at £77.

Wednesbury.—The T.C. has accepted the tender of the British Westinghouse Co. for the supply of two 240-H.P. gas engines and dynamos.

West Ham.—The T.C. has placed an order with the Burroughs Adding and Registering Machine Co. for a large size machine (£85), the tramways manager having had one on trial for some months, with satisfactory results. The tender of the Fuller Electrical Co. for the supply of slow-speed and squirrel cage two-phase motors has been accepted.

NOTES.

The Workmen's Compensation Act, 1906.—Some time must elapse before manufacturers and others can realise the full extent of their liabilities under the above measure. It may not be universally known that the Home Secretary has power to extend the Act to industrial diseases, and that he has recently made an order which has a far-reaching effect. Thus persons suffering from the following complaints, acquired in the following processes, are henceforward to be the victims of an accident:—

(1) Poisoning by nitro and amido derivatives of benzene (dinitro benzol, anilin and others), or its sequelæ. *Process.* Any process involving the use of a nitro or amido derivative of benzene or its preparations or compounds. (2) Poisoning by carbon bisulphide or its sequelæ. *Process.* Any process involving the use of carbon bisulphide or its preparations or compounds. (3) Poisoning by nitrous fumes, or its sequelæ. *Process.* Any process in which nitrous fumes are evolved. (4) Poisoning by nickel carbonyl or its sequelæ. *Process.* Any process in which nickel carbonyl gas is evolved. (5) Arsenic poisoning or its sequelæ. *Process.* Handling of arsenic or its preparations or compounds. (6) Lead poisoning or its sequelæ. *Process.* Handling of lead or its preparations or compounds. (7) Poisoning by *Goniomα Kamassi* (African box-wood) or its sequelæ. *Process.* Any process in the manufacture of articles from African box-wood. (8) Chrome ulceration or its sequelæ. *Process.* Any process involving the use of chromic acid or bichromate of ammonium, potassium, or sodium, or their preparations. (9) Eczematous ulceration of the skin produced by dust or caustic or corrosive liquids, or ulceration of the mucous membrane of the nose or mouth produced by dust. (10) Epitheliomatous cancer or ulceration of the skin or of the corneal surface of the eye, due to pitch, tar, or tarry compounds. *Process.* Handling of or use of pitch, tar, or tarry compounds. (11) Sorotal epithelioma (chimney sweepers cancer). *Process.* Chimney sweeping. (13) Glanders. *Process.* Case of any equine animal suffering from glanders. The following miners diseases are also included:—Nystagmus, brathand, bratknee, bratelbow and inflammation of the wrist. Compressed air illness is also included.

How to Apply for Electricity.—The following form of application is probably unique; we give it exactly as it reached us, suppressing names:—

Where the Work's Done,
Hanley.
June 11th, 1907.

Most Worthy Coadjutor of the Sun, Destroyer of the Demon Darkness, and Shedder of Kilo-Watts and Amperes upon the County borrow of 'Andley. Greeting.

By these presents you are hereby commanded to take notice that to-night your humble petitioner, his superior half, and their attendant company and impediments, have removed their caravanserai from the house numbered ——— to the house numbered ——— in the Nouvelle Rue de ———.

And consequently,

It now becomes my painful duty to inform you that I am compelled, owing to the exigencies of the dwelling, to seek a supply of that luminant nectar which passes so mysteriously along the agglomeration of cohesive metallic molecules, vulgarly termed a wire, and, finally, by your grace, tickles the trembling filaments enclosed by bulbous transparencies, into radiant activity.

Now, therefore,

I do most earnestly exhort and beseech you that you will place me on tap a supply of "the juice" as from to-day, henceforth, until death us do part, or, alternatively, until such time as I learn in the hard and unhappy school of bitter experience, that I must abandon your commodity in favour of one, if any, which is better and less expensive.

Your petitioner further prays that you will send him copies of the following publications issued by your department, viz.:—

1. Volts, Amperes and Kilo Watts, their meaning, if any, and significance.
2. How to diddle the electricity man.
3. How to "cook" the meter.
4. Methods of getting your light for nixes.
5. Do the Hanley electricity works really pay?
6. And any other tome you may deem of interest,

Finally, you are enjoined to make my humble obeisances to ———, whose gracious presence sheds an effulgence over your end of the Park—an effulgence more sparkling and brilliantly beautiful than even the municipal electric light of the County borrow of 'Andly aforesaid,

And your petitioner will ever pray ———.

Though I think you're past praying for.

The Director of Public Glcominosity,
Park Road,
Hanley, Staffordshire.

"Lighten our Darkness, We beseech Thee."

Electrical Barges for Building Materials.—The first annual report of the Ziegel Transport Gesellschaft, of Berlin, which was formed to undertake the carriage of bulk goods by means of electrical barges on inland waterways, and the discharge of the materials by electric cranes, states that the year 1906 was a period of proceeding with the programme prepared by the initial syndicate, and that this preparatory activity will occupy a large portion of the current year. It is expected that the inauguration of this system on the waterways gravitating towards Berlin will result in a considerable economy in time by the use of iron barges equipped with storage batteries and motors, and it is claimed that the method will be superior to any other form of transport. The principal goods to be carried are bricks and limestone, and the containers of those materials will be lifted bodily out of the barges by electrically operated cranes, and deposited on wagons ready for direct conveyance to their destination. In this way the discharge of cargoes will be effected in a few hours, instead of occupying several days, as at present. This necessitates the provision of a number of crane installations in the districts to be served. The first electric crane plant was taken over from the syndicate at the Urban Harbour, and concessions to establish similar installations have already been obtained at several other places, and the equipment is so far advanced, that it is hoped to work them in the course of the present year. Negotiations are proceeding for the purpose of obtaining further concessions. At present the company has four iron barges, and 115 others are on order. A water-power station has been acquired at Zehdenick for the production of electrical energy.

Institution Note.—INSTITUTION OF MECHANICAL ENGINEERS.—The summer meeting is to be held at Aberdeen from Tuesday, July 30th, to Friday, August 2nd. Among the papers to be read is one on "An Electrically-controlled Single-Lever Testing Machine," by C. E. Larard.

Wiring Cost of Small Houses.—As we go to press the following has come to hand:—

"As a conference of this Association with the Borough electrical engineer has been arranged to fully discuss the question of 'The Wiring Cost of Small Houses,' recently before your readers, my reply is withheld in consequence.—Yours faithfully,

EDW. W. JACKSON,
Hon. Sec. West Ham Electrical Contractors' Association."

Appointment Vacant.—Mains superintendent for South Shields Electricity Department, salary £150.

Formation of Ammonia by Electric Sparks.—The synthesis of ammonia from the elements nitrogen and hydrogen by the action of an electric discharge has already formed the subject of four original researches, but it still remains a fact that the exact *roles* of the various influencing factors are open to much doubt. For this reason the matter has been investigated further by Messrs. Briner and Mettler. The concentration of ammonia gas formed by sparking a mixture of hydrogen and nitrogen in a closed vessel at ordinary temperature, does not rise beyond 4 per cent., on account of the reversibility of the reaction. With a chilled mixture, however, the ammonia formation increases rapidly, and when liquid air is employed the conversion into the required product is complete. The influence of pressure is also remarkable. Thus rising from 20 mm. to 800 mm. (mercury pressure), the quantity of ammonia formed rises to a maximum at 100 mm. ($\frac{1}{8}$ atmosphere), and at this point the yield of ammonia is 0·17 gram. per kilowatt-hour. From this point upwards the percentage yield rapidly falls off and is practically nothing at rather more than 1 atmosphere. The cause of this maximum is not far to seek. As the pressure increases, the concentration of the gas increases also. On the other hand, the conductivity of the gaseous mixture decreases. Thus there exist two opposing factors, and a maximum efficiency is arrived at when the two influences are most favourable.—*Revue d'Electrochemie et d'Electro-metallurgie, May*, 1907.

Hospital Electrical Department.—An electrical department is being given to the Royal Devon and Exeter Hospital by Mrs. Sanders, of Stoke Hill, as a memorial to her husband and son. Mr. J. Delpratt Harris will be the head of the department, and the opening will take place a fortnight hence.

The Engineering Exhibition at Olympia.—In connection with the Engineering and Machinery Exhibition to be held at Olympia from September 19th to October 19th next, the G.P.O. Telephone Department is providing telephonic facilities for exhibitors at a charge of £4 to cover exchange calls throughout the London metropolitan area during the period of the Exhibition.

Municipal Trading.—In his address at the annual meeting of the Industrial Freedom League, on July 4th, Sir Felix Schuster referred, among other things, to the extent to which ambitious municipal electric power schemes had prevented private enterprise. Lord Avebury, who also addressed the meeting, took Mr. Lloyd-George's figures of £2,000,000 gross profit on municipal electricity supply, and showed that, if interest and depreciation were adequately allowed for, this profit would be found to have vanished.

Electric Shock Fatality.—An apprentice electrician named Thos. Farrell, while cleaning some fittings in the switch chamber of a sub-station of an electrical company at Middlesbrough, on Friday night, accidentally touched a "live wire," and he fell to the ground and died in a few minutes.

New Radio-Active Substance.—According to the daily Press, a certain M. André Lancien, of the Rochefort School of Medicine, has discovered a substance, called uranyl molybdate, which has practically the same chemical qualities as radium bromide, but costs only £22 per ounce as against £3,600 per ounce in the case of radium bromide. In the preparation of the new substance ammonium molybdate is mixed with uranyl nitrate, and a white deposit is formed which dried in darkness, becomes a white amorphous powder. The latter subsequently turns yellow; it is insoluble in nitric acid and in ethylic acid; and is being tested in Paris with a view to verifying M. Lancien's deductions.

Omne Ignotum pro Mirifico.—We find the following in one of the technical journals of the United States. Anyone might think a reporter from the staff of the ——— had recently emigrated:—"By way of illustrating the rapid increase in the wealth of the country the *Leavenworth Times* announces that the Kansas City Western Electric Railway has 1,700 KW., which is exactly 400 KW. more than it had when the power house burned. It is these things that cause social unrest. Here is a bloated corporation strutting around with 1,700 KW., and thousands of poor people haven't a kilowatt to their name."

Reduction of Capital.—A petition for confirming a resolution of the Sun Electrical Co., Ltd., for reduction of the capital from £50,000 to £45,000, is to be heard in London on July 30th.

Electrical Exhibitions.—The Devonport borough electrical engineer is inviting offers from firms desiring to exhibit there in September. See our advertisement pages for particulars.

The Loughborough Corporation Electricity Department is also to hold an Exhibition (one week), commencing September 10th. A notice to firms interested appears among our "Official Notices" to-day.

Accident.—Early on Wednesday morning two veterinary surgeons, named Cowan and Scott, were driving past an electric tower wagon, used in repairing overhead wires at Colchester, when the horse attached to the wagon became restive, causing a wire to break. It struck Mr. Scott across the face, burning his face slightly, and then caught Mr. Cowan at the back of the neck, rendering him insensible. He was removed home in a critical condition.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—On Saturday, June 29th, the staff and employés of the Ealing electricity works went for their annual outing by brake. The party, some 23 strong, went by way of Twickenham, Kingston, Hook, Leatherhead, and Box Hill, to the ground of the Dorking Cricket Club, for the use of which for the day arrangements had been made. After a varied programme of sports had been carried out, the party adjourned to the Burford Bridge Hotel, Box Hill, for luncheon, Mr. J. Douglas Knight, the borough electrical engineer, being in the chair. A cricket match, "Insides *v.* Outsides," followed, which ended in a draw in favour of the former.

Exeter T.C. has been recommended by the Finance Committee to increase the salary of the electrical engineer (Mr. H. D. Munro) from £350 to £400 per annum.

On retiring from the post of secretary to the Reading Electric Supply Co., Mr. ERNEST FRANCIS has been presented by the directors with a silver rose bowl.

The Metropolitan Borough of Bermondsey's Electricity and Destructor Department held its first annual outing on Saturday, 29th ult., a party of about 60 journeying to Herne Bay. Dinner was served at the Albany Restaurant with Mr. W. E. J. Heenan, the borough electrical engineer, in the chair, supported by other members of the staff. Mr. A. E. Young, chief clerk, submitted the toast of the "Borough Electrical Engineer," and "the continued success of the Electricity and Destructor Undertaking," and in responding, Mr. Heenan remarked on the rapid growth of the undertaking. Mr. A. Vezey, on behalf of the workmen, presented Mr. Heenan with a silver cigarette case as a small token of esteem. During the afternoon some of the party drove over to Canterbury, and all met again for tea at the Albany Restaurant.

The Swindon T.C. has granted £25 to Mr. R. W. GRUBB, assistant electrical engineer, in recognition of extra services rendered during the time he acted as engineer.

The Sheffield T.C. has been recommended to increase the salary of Mr. FEDDEN, general manager of the E.L. undertaking, from £800 to £900 per annum.

Tramway Officials.—Mr. A. D. MURDOCH, manager of the Dartford tramways for Messrs. J. G. White & Co., Ltd., who is leaving to manage the tramways at North Melbourne, Australia, has been presented by the staff with a smoking cabinet.

General.—The Governing Body of the Battersea Polytechnic have appointed Mr. S. G. RAWSON, D.Sc. (London), F.I.C., Principal of the Polytechnic in succession to Mr. SIDNEY H. WELLS, who has been Principal since the foundation of the Institute in 1893, and is resigning to take up the position of Director-General of the Department of Agriculture and Technical Education for Egypt. Mr. Rawson is at present Director of Education for Worcestershire, and was formerly Principal of the Technical College, Huddersfield, and Lecturer at Liverpool University.

The Council of the Institution of Civil Engineers have appointed Sir WILLIAM MATTHEWS, K.C.M.G., President of that Institution, to succeed the late Sir Benjamin Baker, K.C.B., K.C.M.G., as one of their representatives on the main Committee of the Engineering Standards Committee.

Australasian Hardware and Machinery says that Mr. W. CORIN, M.I.C.E., M.I.E.E., for the past 11 years city electrical engineer to the Launceston Corporation, has resigned that position in order to devote all his attention to his private consulting practice. His address is 7, Hill Street, Launceston.

We are informed by Messrs. Merz & McLellan that Mr. CHARLES MERZ will be leaving England on September 13th, for a short visit to Australia, to report upon the proposed electrification of the Victorian suburban railways.

Messrs. E. R. BRIGHTON and W. R. MALCOLM sail on the 30th inst. for Shanghai, where they will immediately commence business as general engineers. Mr. Brighton was engaged for five or six years as assistant to Messrs. Lacey, Sillar & Leigh, with whom he had great and varied experience in all details of electric tramway construction and working, and for which firm he will still act as correspondent. The partners will represent some of the leading English engineering firms, including Callender's Cable Construction Co., Browett and Lindley, Peter Brotherhood, Meldrum Bros., Hayward, Tyler and Co., &c. During the next two or three weeks, Messrs. Brighton & Malcolm will be pleased to receive catalogues from manufacturers and contractors, addressed to their London office, 11A, Wormwood Street, E.C. We wish them complete success in their venture, as we feel sure will all who know them, and as they have youth, energy and ability on their side, they go out well prepared to achieve it.

Obituary.—Sir SPENCER WALPOLE, whose death is announced this week, was secretary to the General Post Office from 1893 to 1899. In 1898 he was created a K.C.B.

NEW COMPANIES REGISTERED.

Broadstone, Ltd. (94,905).—This company was registered on June 27th, with a capital of £1,000 in £1 shares, to acquire the assets and undertaking of the Fleetwood and District Electric Light and Power Syndicate, Ltd., to take a transfer of the Fleetwood Electric Lighting Order, 1890, to act as undertakers under the Electric Lighting Acts, 1882 and 1888, and the Electric Lighting (Clauses) Act, 1899, and to carry on the business of an electric light and power company generally. The first subscribers are:—W. C. Johnson, Broadstone Farm, Colemans Hatch, Sussex, civil engineer, 100 shares; E. G. Vecqueray, 49, Chaucer Road, Bedford, electrical engineer, 1 share; W. G. Pattison, The Dignaries, Westcombe Park, London, private secretary, 1 share; G. Whale, London and County Bank Chambers, Woolwich, solicitor, 1 share; J. T. Cooper, 152, Eglinton Road, Plumstead, clerk, 1 share; H. Archer, 92, Plum Lane, Plumstead, clerk, 1 share; and C. B. Palmer, "Sunnydene," Eglinton Road, Plumstead, clerk, 1 share. No initial public issue. The number of directors is not to be less than two or more than six; the first are W. C. Johnson and E. G. Vecqueray. Registered office, 107, Cannon Street, E.C.

Hendon Electric Supply Co., Ltd. (93,911).—This company was registered on June 27th, with a capital of £50,000 in £5 shares, to adopt an agreement with the Electric Supply Corporation, Ltd., and Crompton & Co., Ltd., and to carry on the business of an electric light and power company in all its branches. The first subscribers (each with one share) are:—C. F. Tufnell, Walendone Manor, Kenley, Surrey, underwriter; K. A. S. Moncrieff, Salisbury House, E.C., engineer; W. Abbott, Electric Supply Corporation, Ltd., Salisbury House, E.C., engineer; H. W. Braine, Salisbury House, E.C., electrical supply technical assistant; C. F. Mounsdon, Salisbury House, E.C., clerk; E. H. F. Reeves, Salisbury House, E.C., secretary; and J. N. A. Houblon, Salisbury House, E.C., engineer. No initial public issue. The number of directors is not to be less than two or more than five; the first are C. F. Tufnell, K. A. S. Moncrieff and Colonel H. Wood, C.B.; qualification, £500; remuneration, £100 each per annum (£50 extra for the chairman) and 5 per cent. of the surplus net profits after 7 per cent. dividend has been paid, divisible.

Wright & Wood, Ltd.—This company was registered on June 25th, with a capital of £12,000 in £1 shares (£3,000 preference), to carry on the business of manufacturing, electric and mechanical engineers, iron and brassfounders, metal workers, cable makers, rubber manufacturers, makers of and dealers in electric, magnetic, telegraphic, telephonic and other appliances and apparatus, &c. The first subscribers (each with one share) are:—H. H. Wright, 5, Queen's Gate, Halifax, electrical engineer; H. R. Wood, 47, Mayfield Avenue, Halifax, electrical engineer; J. H. Cresswell, 3, Montague Street, Sowerby Bridge, clerk; F. W. Wright, Green Leas, Halifax, mechanical engineer G. E. Garside, 7, Suries Road, Halifax, auctioneer and valuer; Miss C. A. Wood, 47, Mayfield Avenue, Halifax; and J. R. Learoyd, Heath Crescent, Halifax, chartered accountant. No initial public issue. The number of directors is not to be less than two or more than five; the first are: H. H. Wright and H. R. Wood (permanent governing directors, subject to holding 500 ordinary shares each); qualification of managing and other directors (except governing directors) £100 shares; remuneration as fixed by the company.

Cablerie Du Nord, Ltd. (93,978).—This company was registered on July 2nd, with a capital of £5,000 in £1 shares, to take over by way of contribution (apport) or otherwise, the business of rope manufacturers and boiler coverers, carried on at Armentieres, France, as "Willian Kenyon & Sons, Cablerie du Nord," and to carry on the same and the business of manufacturers of and dealers in ropes, cables (including electric cables), belts, bandings, twines, cords, tapes and braids, whether spun, twisted, doubled, folded, woven, plaited or otherwise manipulated and manufactured from cotton, wool, silk, hair, ramie, manilla, hemp, jute, flax, linen or other fibrous substances, or from hides, leather, iron, steel, brass, copper, aluminium or other metal, &c. The first subscribers (each with one share) are:—G. H. Kenyon, Brookfield, Ashton-under-Lyne, rope manufacturer; Edwin Kenyon, Welford Lodge, Marple, Cheshire, rope manufacturer; W. Kenyon, 15, Brunswick Road, Withington, Manchester, rope manufacturer; A. Kenyon, Brookfield, Ashton-under-Lyne, rope manufacturer; Ernest Kenyon, 6, Seymour Road, Fulwood, Preston, rope manufacturer; Mrs. E. H. Kenyon, Brookfield, Ashton-under-Lyne; and Mrs. L. Kenyon, Welford Lodge, Ashton-under-Lyne. No initial public issue. The number of directors is not to be less than three, or more seven; the first are G. H. Kenyon, Edwin Kenyon, W. Kenyon, A. Kenyon, Ernest Kenyon, and A. Fihey. No qualification required for nominees of Wm. Kenyon & Sons, Ltd. Qualification of other directors, £250; remuneration as fixed by the company. Registered office, Chapelfield Works, Dukinfield, Cheshire.

British Electric Detonator Co., Ltd. (94,000).—This company was registered on July 3rd, with a capital of £6,000 in £1 shares, to acquire certain benefits, rights, property and effects connected with the business of manufacturers of fuseheads in connection with detonators as applied to explosives, to adopt an agreement with the Lancashire Explosives Co., Ltd., A. J. Jordan, and G. A. Jordan, and to carry on the business of manufacturers and producers of, and wholesale and retail dealers in, fuseheads or electric fuses for blasting purposes, &c. The subscribers (each with one share) are:—F. L. Abbott, 19, Castle Street, Liverpool, carrier; J. Leigh, Chesham, Alderley Edge, Chester, solicitor; J. McConnal, Dunivaig, Montpellier Crescent, New Brighton, Chester, gentleman; T. Abbott, Landora, Greenwalk, Bowdon, Chester, carrier; S. Salisbury, 62, Ayres Road, Brooks Bar, Manchester, explosives expert; G. A. Jordon, 2, Albert Street, Manchester, electric fuse maker; and G. Forsyth, 3, Oak Avenue, Old Trafford, Manchester, cashier. No initial public issue. S. Salisbury is governing director for life. Remuneration as fixed by the company. Registered office, 2, Albert Street, Manchester.

Railway Construction Co., Ltd. (93,871).—This company was registered on June 25th, with a capital of £10,000 in £10 shares, with objects as indicated by the title. The first subscribers (each with one share) are:—G. W. Elliott, Audley Road, Hendon, bank manager; P. Edelston, 4, Chapel Walks, Manchester, export merchant; W. A. Watson, Holmleigh, Bengal Road, Ilford, secretary; H. E. West, 1, Coningham Road, Shepherd's Bush, W., accountant; W. H. Fox, Wymondley, Parva, Hetts, F.I.D.; W. E. Murphy, 1, Gordon Cottages, Duke's Lane, Kensington, W., clerk; and A. E. Armstrong, 3, Bellclose Road, West Drayton, clerk. No initial public issue. Registered without articles of association; the first directors are P. Edelston and G. W. Elliott. Registered office, 9½, Union Court, Old Broad Street, E.C.

Booth Coils (Preliminary), Ltd. (93,904).—This company was registered on June 27th, with a capital of £10,000 in £1 shares, with objects as indicated by the title. The first subscribers (each with one share) are:—A. R. Roberts, 63, Queen Victoria Street, E.C., solicitor; W. B. Carnley, 63, Queen Victoria Street, E.C., articled clerk; J. E. Morris, 63, Queen Victoria Street, E.C., solicitor; G. D. Cass, 63, Queen Victoria Street, E.C., clerk; A. H. Cohen, 63, Queen Victoria Street, E.C., clerk; S. Watkins, 63, Queen Victoria Street, E.C., clerk; and M. Maud Humphreys, 63, Queen Victoria Street, E.C., clerk. No initial public issue. Registered without articles of association.

Electrical Securities Trust, Ltd. (6,567).—This company was registered in Edinburgh on July 3rd, with a capital of £200,000 in £1 shares, to carry on the business of an investment trust company in all its branches, and in particular in the branch indicated by the title. The first subscribers (each with one share) are:—A. Shepherd, 63, Castle Street, Edinburgh, W.S.; R. Stewart, 63, Castle Street, Edinburgh, solicitor; G. H. Boyd, 63, Castle Street, Edinburgh, solicitor; J. Guild, 20, Castle Street, Edinburgh, W.S.; J. Bowhill, 22, St. Andrew Square, stockbroker; J. Ivory, 43, Charlotte Square, Edinburgh, chartered accountant; and L. M. Mackenzie, 20, Alva Street, Edinburgh, W.S. The number of directors is not to be less than three or more than six; the first are A. Shepherd, J. Bowhill, J. Guild, R. S. Portheim, and A. W. Tait; qualification, 100 shares; remuneration, £350 per annum divisible. Registered office, 43, Charlotte Square, Edinburgh.

British Carbide Factories, Ltd. (93,999).—This company was registered on July 3rd, with a capital of £15,000 in £1 shares, to exploit any chemical and electro-chemical processes, and to carry on the businesses of manufacturers and dealers in carbide of calcium or any electro-chemical products and apparatus and electrical or other plant, &c. The first subscribers (each with one share) are:—M. Hays, 22, St. Peter's Square, Hammersmith, secretary; P. J. Hays, 12A, Sydney House, Bedford Park, W., general manager; A. S. Young, 85, Claremont Road, Highgate, N., clerk; A. Akers, 31, Walbrook, E.C., chartered secretary; A. T. Hilton, 70, Tulsmere Road, West Norwood, S.E., accountant; T. W. Hall, 61, West Smithfield, E.C., solicitor; and E. Wallington, 87, Churchill Road, Willesden Green, managing clerk. No initial public issue; the number of directors is not to be less than three or more than five; the first are: H. Compton, A. Howard, and A. Akers; qualification £200; remuneration as fixed by the company; registered office, 178, Tower Bridge Road, S.E.

Birmingham Electrical Case Co., Ltd. (93,998).—This company was registered on July 3rd, with a capital of £1,000 in £1 shares, to acquire the business carried on by E. Bennett, as an electrical case maker and cabinet maker at 109, Unett Street, Birmingham, or elsewhere. The first subscribers are:—P. T. Thompson, 21, Salisbury Road, Handsworth, insurance agent, 25 shares; H. B. Thompson, 12, Haughton Road, Handsworth, stone merchant 25 shares; F. E. Bill, 6, Cherry Street, Birmingham, solicitor, 25 shares; E. Bennett, 109, Unett Street, Birmingham, electrical case maker, 1 share; H. Robinson, 24, Soho Road, Handsworth, architect and surveyor, 1 share; D. A. Bill, 286, Hagley Road, Birmingham, auctioneer, 1 share; and H. G. Headley, 30 Portland Road, Edgbaston, clerk, 1 share. No initial public issue. The number of directors is not to be less than two or more than five; the first directors are O. T. Thompson, F. E. Bill and E. Bennett (all permanent); qualification, £25; E. Bennett is managing director, subject to holding £100 shares. Registered office, 109, Unett Street, Birmingham.

North-Eastern Electrical Stores, Ltd. (94,048).—This company was registered on July 5th, with a capital of £1,000 in £1 shares, to acquire the business formerly carried on by the Northern Electrical Supply Stores, Ltd., and recently by F. H. Potts, at 92, Northumberland Street, Newcastle-on-Tyne, to adopt an agreement with the said F. H. Potts, and to carry on the business of manufacturers of, and dealers in, electric lamps and bulbs, bells, batteries, motors, dynamos, accumulators, stores, engines and apparatus, electricians, engineers, &c. The first subscribers (each with one share) are:—F. H. Potts, 47, Alwinton Terrace, Gosforth, electrician; J. G. Potts, 47, Alwinton Terrace, Gosforth, tailors' cutter; Mrs. E. A. Potts, 47, Alwinton Terrace, Gosforth; G. Paull, 45, Alwinton Terrace, Gosforth, traveller; Mrs. E. L. Paull, 45, Alwinton Terrace, Gosforth; R. W. Laidler, Riverdale, Bardon Mill, draper; and A. F. Hawdon, 18, Ridley Place, Newcastle, electrical engineer. No initial public issue. The number of directors is not to be less than two or more than five; the first are F. H. Potts and A. F. Hawdon. Registered office, 93, Northumberland Street, Newcastle-on-Tyne.

Missenden and District Electric Light and Power Co., Ltd. (93,941).—This company was registered on June 29th, with a capital of £4,000 in £1 shares, to supply electricity in the parishes of Great Missenden, Little Missenden, and Lee, Bucks, and to carry on the business of electricians, engineers, producers, and workers of and dealers in electricity, motive power and light, &c. The first subscribers (each with one share) are:—E. O. Turner, Great Missenden, surgeon; S. F. Beck, Great Missenden, land agent; R. H. Rushford, Amersham, solicitor; J. W. Harvey-Ellis, Great Missenden, land agent; W. Clay, Great Missenden, butcher; J. Brown, Great Missenden, grocer; and E. Putty, Great Missenden, clerk. Registered without articles of association. The first directors are G. Carrington, S. F. Beck, and W. Clay; registered office, High Street, Amersham, Bucks.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

City of London Electric Lighting Co., Ltd. (34,406).—This company's annual return was filed on April 29th, when 70,595 ordinary, and 40,000 preference shares had been taken up out of a nominal capital of £1,200,000 in £10 shares (40,000 preference). £10 per share had been called up, resulting in the receipt of £1,105,950. Mortgages and charges: £800,000.

Howard Asphalt Troughing Co., Ltd. (formerly Howard Conduits Co., Ltd.), (69,270).—This company's annual return was filed on April 5th, when 1,007 ordinary, and 1,000 deferred shares had been taken up out of a nominal capital of £20,000 in £1 shares (1,000 deferred). £7 has been paid, and £2,000 is considered as paid. Mortgages and charges: Nil.

Waterworks, Lighting and Power Investment Corporation, Ltd. (88,390).—Issue on May 25th of £200 6 per cent. debentures, part of series created August 8th, 1906, to secure £10,000, charged on the company's property, present and future. No trustees. No previous issue of same series.

Electrical Power Storage Co., Ltd. (30,313).—Issue on May 28th of £500 5 per cent. debentures, part of series created February 14th, 1907, to secure £30,000, charged on the company's undertaking and property, including uncalled capital. No trustees. Previously issued of same series: £7,900.

Witney Electric Supply Co., Ltd. (62,336).—This company's annual return was filed on April 15th, when 2,849 preference and 2,802 ordinary shares had been taken up out of a nominal capital of £10,000 in £1 shares (5,000 preference). £1 per share has been called up on 2,829 preference and 1,802 ordinary, resulting in the receipt of £4,629 2s. 6d. £21 17s. 6d. remains in arrears. A further £3 2s. 6d. has been paid on 25 forfeited shares. £1,000 is considered as paid on 1,000 ordinary. Mortgages and charges: £3,500.

Laurence, Scott & Co., Ltd. (50,656).—This company's annual return was filed on April 29th, when 45 £1 and 2,106 £10 shares had been taken up out of a nominal capital of £50,000 in 50 shares of £1 each, and 4,995 shares of £10 each. £1 per share has been called up on 45, and £10 per share on 728 shares, and £7,275 has been received. £13,830 is considered as paid on 1,383 £10 shares. Mortgages and charges: £22,200.

British Railway Traffic and Electric Co., Ltd. (74,227).—This company's annual return was filed on April 8th, when 70,000 shares had been taken up out of a nominal capital of £100,000 in £1 shares, £1 per share has been called up on 100, and 10s. per share on 69,900, and £35,050 has been received. Mortgages and charges: Nil.

Gent & Co., Ltd. (79,797).—This company's annual return was filed on May 11th, when 4,427 preference and 20,876 ordinary shares had been taken up out of a nominal capital of £50,000 in 20,000 preference and 30,000 ordinary shares of £1 each. £1 per share has been called up on 957 preference and 5,980 ordinary and £6,887 has been received. £18,416 is considered as paid. Mortgages and charges: £20,500.

Tubes, Ltd. (91,224).—This company's annual return was filed on June 6th, when 74,475 shares had been taken up out of a nominal capital of £100,000 in £1 shares. £1 per share has been called up on 57,495, resulting in the receipt of £57,479. £16 remains in arrears. £16,980 is considered as paid. Mortgages and charges: £30,850.

Newquay Electric Light and Power Co., Ltd. (85,451).—Issue on May 30th of a £100 5 per cent. debentures, part of series created June 30th, 1906, to secure £4,000, charged on the company's undertaking and property, present and future, including uncalled capital. No trustees. Previously issued of same series: £3,600.

D. Santoni & Co. (1906), Ltd. (electrical engineers, London) (89,277).—Issue on June 3rd of £1,650 6 per cent. debentures, part of series created May 31st, 1907, to secure £2,750, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. M. I. Power, London and County Bank, Covent Garden, W.C. No trustees. No previous issue of same series. A memorandum of satisfaction in full of a mortgage debenture bond dated February 25th, 1907, securing £1,000, has also been filed.

Ernest F. Moy, Ltd. (electrical engineers, London) (47,408).—Particulars of £3,000 debentures, created by resolution of the company dated August 31st, 1906, and resolution of the board dated November 26th, 1906, and secured by a trust deed dated May 23rd, 1907, have been filed pursuant to Section 14 (4) of the Companies' Act, 1900. The above-mentioned trust deed has also been registered. Property charged: Leasehold premises in Greenland Place and Bayham Street, N.W., and the company's undertaking and property, present and future, including uncalled capital. Trustees: J. Dyer, 9, St. Paul's Road, Cliftonville, Margate, and E. F. Moy, Greenland Place, Camden Town, N.W.

Cutler, Wardle & Co., Ltd. (electrical engineers, &c., Manchester) (93,564).—A debenture dated June 5th, 1907, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital, has been registered. Holder: J. E. Berrey, Holly Lodge, Clumber Road, The Park, Nottingham.

Buenos Ayres and Belgrano Electric Tramways Co., Ltd. (55,937).—This company's annual return was filed on May 23rd, when 100,000 ordinary, 40,000 "A" preference and 27,500 "B" preference shares had been taken up out of a nominal capital of £850,000 in 100,000 ordinary, 40,000 "A" preference and 30,000 "B" preference shares of £5 each. £5 per share has been called up on 40,000 "A" preference, resulting in the receipt of £200,000. £637,500 is considered as paid on 100,000 ordinary and 27,500 "B" preference. Mortgages and charges: £500,000.

Windermere and District Electricity Supply Co., Ltd. (41,461).—This company's annual return was filed on April 19th, when 5,000 preference and 3,000 ordinary shares had been taken up out of a nominal capital of £50,000 in 5,000 preference and 5,000 ordinary shares of £5 each. £5 per share has been called up on 3,040 preference and 1,780 ordinary, resulting in the receipt of £23,850. £16,150 is considered as paid on 1,960 preference and 1,270 ordinary. Mortgages and charges: £16,800.

New Electric Rifle and Target Co., Ltd. (87,477).—This company's annual return was filed on April 5th, when the entire capital of £16,000 in £1 shares (6,277 "A," 5,600 "B" and 4,123 "C") had been taken up. £1 per share has been called up on 6,277 "A," resulting in the receipt of £6,277. £7,786 2s. is considered as paid, being 17s. 6d. per share on 5,600 "B" and 14s. per share on 4,123 "C." Mortgages and charges: £2,000.

Urban Electric Supply Co., Ltd. (57,986).—A conveyance dated May 30th, 1907 (supplemental to a trust deed dated July 28th, 1904, and indentures dated December 17th, 1906, and April 27th, 1907, securing £275,000 4½ per cent. first mortgage debenture stock and any further issues thereunder, up to the amount of the paid-up share capital), has been registered. Property charged: Certain land in the Tything of Greenham, Newbury, Berks, known as the "Island," land and premises at Greenham, known as the Greenham Fellmongery, and land at Weybridge, forming part of the Portmore Park Estate, with right of way thereto. Trustees: Merchants' Trust, Ltd., 63, Cornhill, E.C.

Maxim Electrical Co., Ltd. (Westminster), (84,426).—Issue on June 11th of £1,100 5 per cent. debentures, part of series created by resolutions of May 16th and November 29th, 1906, to secure £15,000 charged on the company's undertaking and property, present and future, including uncalled capital. No trustees. Previously issued of same series: £11,200.

Hankow Light and Power Co., Ltd. (87,331).—Particulars of £10,000 debentures, created by resolution of May 24th, 1907, have been filed pursuant to Sec. 14 (4) of the Companies' Act, 1900. Property charged: The company's undertaking and property, present and future, including uncalled and unpaid capital. No trustees.

National Electric Construction Co., Ltd. (53,364).—This company's annual return was filed on June 6th, when 170,000 shares had been taken up out of a nominal capital of £250,000 in £1 shares; £1 per share has been called up on 151,149, resulting in the receipt of £151,149; £18,851 is considered as paid on 18,851 shares. Mortgages and charges: £75,000.

Bromley (Kent) Electric Light and Power Co., Ltd. (54,127).—This company's annual return was filed on April 24th, when 15,000 shares had been taken up out of a nominal capital of £100,000 in £5 shares; £75,000 has been received. Mortgages and charges: £70,000.

Chislehurst Electric Supply Co., Ltd. (50,980).—This company's annual return was filed on April 24th, when the entire capital of £15,000 in £5 shares had been taken up and paid for in full. Mortgages and charges: £10,000.

A. Reyrolle & Co., Ltd. (Electrical engineers, Hebburn) (70,210).—Issue on June 6th of £12,900 5 per cent. debentures, part of series created April 17th, 1907, to secure £20,000, charged on the company's undertaking and property, present and future, except uncalled capital. No trustees. No previous issue of same series.

Wycombe (Borough) Electric Light and Power Co., Ltd. (53,135).—This company's annual return was filed on April 19th, when 8,000 shares had been taken up out of a nominal capital of £50,000 in £5 shares. £40,000 has been received. Mortgages and charges: £40,000.

Telephone Co. of Egypt, Ltd. (17,824).—This company's annual return was filed on April 30th, when 28,000 preferred and 4,000 deferred shares had been taken up out of a nominal capital of £200,000 in 36,000 preferred and 4,000 deferred shares of £5 each. £5 per share has been called up on 16,000 preferred shares, resulting in the receipt of £80,000. £80,000 is considered as paid on 12,000 preferred and 4,000 deferred. Mortgages and charges: £100,000.

Okonite Co., Ltd. (69,327.)—This company's annual return was filed on April 24th, when the entire capital of £120,000 in 32,000 preference and 16,000 ordinary shares of £2 10s. each had been taken up; £2 10s. per share has been called up on 100 ordinary and 110 preference shares, resulting in the receipt of £525; £119,475 is considered as paid on the remainder. Mortgages and charges: £50,400, of which £33,300 are in the hands of trustees for the company.

D.P. Battery Co., Ltd. (Bakewell and London) (44,084).—A memorandum of satisfaction, to the further extent of £2,000, of first debentures, dated October 29th, 1901, securing £9,000, has been filed. Previous partial satisfactions registered, £2,250.

Oriental Telephone and Electric Co., Ltd. (40,691).—A memorandum of satisfaction to the extent of £900 of debenture stock covered by a trust deed dated June 28th, 1905, securing £100,000, has been filed.

Telephone Co. of Egypt, Ltd. (17,824).—A memorandum of satisfaction to the extent of £900 of debenture stock covered by a trust deed dated July 27th, 1904, securing £60,000, has been filed.

James & Browne, Ltd. (electricians, Hammersmith) (72,372).—Issue on May 27th of £150 5 per cent. debentures, part of series created June 29th, 1906, to secure £6,000 charged on the company's undertaking and property, present and future, including uncalled capital. Trustees: J. W. Ellis, Portland House, Basinghall Street, E.C.; and E. Hughes, 106, Holland Road, Kensington, W. Previously issued of same series: £4,700.

Sanfil, Ltd. (91,494).—This company's annual return was filed on May 17th, when 24,007 shares had been taken up out of a nominal capital of £5,000 in 100,000 shares of 1s. each. 1s. per share has been called up on 4,007, resulting in the receipt of £200 7s. £1,000 is considered as paid on 20,000 shares. Mortgages and charges: Nil.

Siemens Brothers Dynamo Works, Ltd. (London and Stafford) (88,928).—A trust deed dated June 10th, 1907, to secure £200,000 debenture stock created by resolution of even date, has been registered. Property charged: the company's undertaking and assets, present and future, including freehold works at Stafford, but excluding uncalled capital. Trustees: A. Siemens and G. von Chauvin, 12, Queen Anne's Gate, Westminster.

Oriental Telephone and Electric Co., Ltd.—An acknowledgement of indebtedness, dated June 12th, 1907, creating a further £100,000 debenture stock (supplemental to a trust deed dated June 28th, 1905, securing £100,000 debenture stock), has been registered. Property charged: The company's assets, present and future. Trustees: Sir Auckland Colvin, K.C.S.I., K.C.M.G., C.I.E.; Earl Soham, Framlingham, Suffolk; and G. F. Braithwaite, Kendal, Westmoreland.

Kalgoorlie Electric Power and Lighting Corporation, Ltd.—A trust deed dated June 5th, to secure £60,000 debentures created February 1st, 1907, has been registered. Property charged: Leasehold hereditaments on the East Coolgardie Goldfields of Western Australia, with fixtures and appurtenances, and the company's undertaking and property, present and future, including uncalled capital. Trustees: Mines and Banking Corporation, Ltd., Finsbury House, E.C.

ELECTRIC TRAMWAY ACCOUNTS.

Glasgow Municipal Tramways.

THE thirteenth annual report of the Glasgow Tramways Committee is, as usual, of a comprehensive and interesting kind. It indicates the continued prosperity of what has always been a most successful undertaking.

The chief items of financial and working data are set forth herewith, and it is interesting to note that the year's gross balance shows an increase of £45,916 over the 1906 return. The gross balance, including interest on surplus revenue, amounted to £414,096, and this has been applied in meeting rental of the Govan and Ibrox tramways, payment to the Paisley District Tramways Co., interest on capital, sinking fund, income-tax, depreciation and permanent-way renewals fund, Parliamentary expenses, and annual payment to the common good; these payments are detailed in our profit statement, and amount in all to £343,817. The net balance remaining amounts to £70,279, of which £45,000 has been applied in meeting special depreciation on buildings and power station plant, and the balance of £25,279 has been added to the general reserve fund.

Notwithstanding that the common good, or more familiarly, "the ratepayer," has benefitted by direct payments, since 1895, to the extent of over a quarter of a million, in other ways the financial standing of the undertaking is excellent.

Thus the balance standing at the credit of the depreciation fund now amounts to the substantial total of £1,079,253; some £213,408, less £39,409 expended during the year, having been added to the fund in 1907.

As regards the general reserve fund, £25,279 was transferred thereto, and £21,870 deducted (on account of street alterations) leaving a sum of £42,851 standing to the credit of that fund.

In addition to these sums, of course, interest and sinking funds have absorbed their usual amounts.

During the year some seven additional route-miles of tramways have been opened for traffic; the length of single track in operation stands at the respectable total of 176 miles, made up approximately as follows:—Glasgow 109, Govan 8, Partick 4·6, Clydebank 4, Paisley 2·9, Rutherglen 4·1, Pollokshaws 1·4, Renfrew ·6, Lanark County 25·4, and Renfrew County 15·6 miles; some 161½ miles being owned by the Corporation, and the remainder either leased or worked under running powers.

Compared with the previous year, the average traffic revenue has increased from 10·34d. to 10·46d., and the working expenses have decreased from 5·79d. in 1906, to 5·72d. in the year under review. Of the working expenses, ·369d. per car-mile (·301d. per KW.-hour) represent power costs, these items being a trifle higher than last year's figures, which were ·346d. and ·293d. respectively.

The Pinkston station turned out some 28,553,053 KW.-hours, exclusive of the amount used on the station, the cost of production (including fuel, water, &c., salaries and wages, repairs to generating and sub-station plant, cables, &c.) was ·295d. per KW.-hour; rates, &c., and management increased this to ·348d. per KW.-hour. Including financial charges and an allowance of ·309d. for depreciation, the total average power costs amounted to 1·05d. per KW.-hour.

Some 1·6 million units were sold to the electricity department during the year, making rather over 5 million units disposed of in this way since 1902; inclusive of this supply the maximum load amounted to 9,486 KW., and the load factor to 35·6 per cent., and exclusive, to 8,139 KW. and 39·2 per cent. respectively.

The Pinkston plant is to be increased by the installation of two 3,000-KW. turbo-generator units, with a view to meeting an increased output; and as a safeguard against failure of supply, a H.T. trunk main has been laid connecting to the Port Dundas station of the electricity department.

GENERAL STATEMENT.—For 12 months ending May 31st, 1907.

Length of route	88 miles
Total length of track	176 miles
Average number of cars in use	543·9
Total number of cars in stock	780
Car-miles run	20,350,367
Passengers carried	224,063,098
Capital expended to date	£3,104,061
Traffic receipts	£887,381
Total receipts	£895,842
Working expenses	£485,256
Gross profit	£410,586
Income per car-mile	10·56d.
Working expenses per car-mile	5·72d.
Interest and sinking fund per car-mile	1·34d.
Rentals of leased lines per car-mile	·11d.
Total expenses per car-mile	7·17d.
Profit per car-mile	3·39d.
Cost of energy per car mile	·369d.
Average fare per passenger	·95d.
Revenue per mile of route	£10,180
Expenditure per mile of route	£5,514
Total tramway units used	24,974,056
Tramway units used per car-mile	1·23
Percentage of working expenses to receipts	54

The gross profit of £410,586, together with interest on surplus revenue, making a total of £414,096 were allocated as follows:—

Interest on capital	£63,769
Sinking fund	49,777
Income-tax	9,932
Rental of Govan and Ibrox tramways	5,079
Payment to Paisley District Tramways Co.	4,674
Depreciation fund	85,031
Permanent way renewals fund	83,377
Parliamentary expenses	6,978
Payment to common good	35,000
Net balance	70,279
	£414,096

The net balance was disposed of as shown in our opening comments.

The general manager is Mr. Jas. Dalrymple.

CITY NOTES.

Shanghai Mutual Telephone Co., Ltd.

THE fourth annual meeting was held at Shanghai on May 23rd, Dr. N. Macleod presiding.

The report and accounts having previously been read, the CHAIRMAN said that the building of the new premises at Overbeck was being pushed forward very rapidly. The Automatic Telephone Construction Co. had publicly criticised the plant and methods of the company, and had asked the directors to adopt their switchboards and instruments. This proposal was rejected. Mr. Oberg, the secretary, had visited America to inspect the Automatic Co.'s methods, and found that the subscribers there were no better satisfied than were those of his own company. The automatic switchboards, the Chairman stated, were unsuited to the climatic conditions of China. The company was also on the point of arriving at a definite understanding with the Chinese Telegraph Administration with regard to the connection of a Shanghai city exchange with that of the company. In the working expenses, salaries for 1907 stood at Tls. 29,400, showing an increase on 1906 of Tls. 15,400; the reconstruction and strengthening of the Pootung overhead lines incurred an expenditure of Tls. 4,511, a new Pootung cable Tls. 2,300, and the reconstruction of lines along tramways Tls. 4,000, part of which the tramway company would pay. The reserve of Tls 100,000 had been transferred to construction account, and written off the Shanghai and Pootung exchanges, which now stood at Tls. 354,790. Debts amounted to Tls. 10,000, of which Tls. 4,000 had been collected. After some discussion, the report and accounts were adopted.

In the discussion following, the agreement with the municipal council regarding franchise was criticised. It was suggested that 10 per cent. of the users of the telephones should be necessary to make a formal complaint to the Council, but after some discussion 33⅓ per cent. was decided upon.

United River Plate Telephone Co., Ltd.

THE directors recommend a final dividend of 5 per cent. on the ordinary shares, making 8 per cent. for the year. This is at the same rate as for last year.

City of Wellington Electric Light and Power Co., Ltd.

THE fourteenth ordinary general meeting of the above company, was held at the offices, New Broad Street, E.C., on Thursday, July 4th, Mr. H. R. Savory (chairman) presiding.

In moving the adoption of the report (see p. 17, ELECTRICAL REVIEW, July 5th), the CHAIRMAN said that at the last annual meeting of the company, he told the shareholders that in view of the threatened competition of the Corporation of Wellington, they were taking legal opinion as to the powers of the company to restrain the Corporation from doing so. The legal opinions obtained both in this country and in New Zealand, were unanimous that the company had no monopoly in the supply to consumers under their Act of Parliament, and they, therefore, asked Mr. Salt, one of the directors, to go out to Wellington, with a view to coming to some arrangement with the City Council. After long negotiations, the Council finally offered to buy the undertaking, and made an offer of £150,000 in 4 per cent. City bonds. The offer was submitted to the shareholders and accepted by them, and the board entered into a contract for sale, which contract provided for the taking over of the company's business by the City Connoil on the 31st of this month. As their business was now passing away from them, there was no need to go very fully into details. The year under review had been a very prosperous one—in fact, the most prosperous year's trading that the company had ever done. The net profit for 1906 was £16,610, an increase of £2,385 on that for 1905. Looking over the net profit for the last five years, he said that in 1902 they were £9,079; in 1903, £10,525; in 1904, £13,798; in 1905, £14,202; and last year, £16,610. The gross revenue showed an increase of £3,333, and the expenditure had increased by £940. The principal item on that account was repairs and alterations, £920. In 1905 they lost the public lighting, as the City Council put up plant for this purpose under the terms of the Act, but although they lost the revenue accruing therefrom, the revenue derived from the other business made up for the loss. The additional units generated in 1906 were 171,509, and the number of lamps added to the station load was 13,303. The directors now recommended the payment, as a final dividend, of 22 per cent., making 15 per cent. for the year.

Mr. H. E. SALT seconded the motion, and the report was adopted.

Chili Telephone Co., Ltd.

THE directors' report for the year ended March 31st, 1907, says that the company's plant suffered severely in the earthquake disaster of last August, and the necessary repairs and reconstruction incurred in consequence have greatly increased the expenditure. The aggregate number of subscribers at all centres at the end of the year was 7,115, as compared with 7,270 at the beginning, or a loss of 155 for the year. The gross revenue in Chili from all sources was $1,169,488, an increase of $78,919. The expenditure in Chili was $648,549, an increase of $147,517. The net income in Chili from all sources was $520,938, a decrease of $68,598. The average rate of exchange for the year was 14·01d., as compared with 15·24d. in the previous year, giving a decrease for the year of 1·23d. Converted into sterling at these rates, the preceding income figures are £30,414, a decrease of £7,021. The liquid assets and liabilities in Chili on March 31st, 1907, were valued at 12⅞d., the current rate of exchange on that day, as compared with 15¼d. at which they were valued on the corresponding date of the previous year. The balance to the credit of the revenue account, including £2,653 brought forward, is £29,892, of which £9,564 has been carried to reserve. An interim dividend of 3s. per share, free of income-tax, was paid on January 16th last, and the directors now recommend a final dividend of 5s. per share, free of income-tax, leaving a balance of £2,727 to be carried forward. The total mileage was on March 31st, 1907, 12,678 miles, 746 yds., an increase of 305 miles, 353 yds.

The Electric Construction Co., Ltd.

IN their report for the year ended May, 1907, the directors say that very severe competition has continued to prevail throughout the year in the electrical manufacturing industry. The increased price of copper and other materials has also been prejudicial, a corresponding increase in the price of electrical plant not having been obtainable, particularly during the first half of the financial year. In consequence, they much regret that the year's operations, after payment of £10,250 for debenture interest and crediting £5,000, as formerly, to depreciation account, show a loss of £1,442. This has been deducted from the surplus of £1,651 brought forward from last year, leaving a balance to be carried forward of £209. During the year several important contracts have been completed at home and abroad. The volume of business in hand is greater than at this time last year, and includes important orders from the Admiralty, London County Council, Wolverhampton Corporation, and others. Prices have also improved. The directors, therefore, take a hopeful view of the outlook, reasonable selling prices being alone necessary to restore the company's prosperity. The directors deplore the death of their Chairman, Mr. James William Barclay, whose valuable services to the company for many years they sincerely acknowledge. Mr. Walter S. B. McLaren has accepted a seat at the board, and has been appointed Chairman. The meeting is to be held on July 18th. [For the previous year the profits available for distribution were £6,045, of which £4,395 went in preference dividend, and £1,651 was carried forward.]

MARKET QUOTATIONS.

Wednesday, July 10th.

	CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a	Acid, Hydrochloric	per cwt.	5/-	..
a	,, Nitric	per cwt.	22/-	..
a	,, Oxalic	per cwt.	38/-	..
a	,, Sulphuric	per cwt.	5/6	..
a	Ammoniac, Sal	per cwt.	42/-	..
a	Ammonia, Muriate (crystal) ..	per ton	£33 10	..
a	,, ,, ...	per ton	£30	..
a	Bleaching powder	per ton	£5 10	..
a	Bisulphide of Carbon	per ton	£18	..
a	Borax	per ton	£15	..
a	Copper Sulphate	per ton	£33 10	..
a	Lead, Nitrate	per ton	£34	..
a	,, White Sugar..	per ton	£35	..
a	,, Peroxide	per ton	£32	..
a	Methylated Spirit	per gal.	2/6	..
a	Potassium Bichromate, in casks	per lb.	3½d.	..
a	Potash, Caustic (75/80 %) ..	per ton	£20	..
a	,, Chlorate	per lb.	3½d.	..
a	,, Perchlorate	per lb.	9d.	..
a	Potassium Cyanide	per lb.	7½d.	..
a	Shellac	per cwt.	220/-	..
a	Sulphate of Magnesia	per ton	£4 10	..
a	Sulphur, Sublimed Flowers ..	per ton	£6 10	..
a	,, Recovered	per ton	£5 10	..
a	,, Lump	per ton	£5	..
a	Soda, Caustic (white 70 %) ..	per ton	£10 15	..
a	,, Chlorate	per lb.	3½d.	..
a	,, Crystals	per ton	£3 5	..
a	Sodium Bichromate, casks ..	per lb.	3d.	..
a	,, Cyanide (basis 100 %) ..	per lb.	7d.	..
	METALS, &c.			
b	Aluminium Ingots, in ton lots ..	per ton	£200	..
b	,, Wire, in ton lots ..	per ton	£220	..
b	,, Sheet, in ton lots ..	per ton	£210	..
p	Babbitt's metal ingots	per ton	£60 to £195	..
c	Brass (rolled metal 2' to 12') basis	per lb.	10½d.	..
c	,, Tube (brazed)	per lb.	1/-	..
c	,, ,, (solid drawn).. ..	per lb.	10½d.	..
c	,, Wire, basis	per lb.	10½d.	..
c	Copper Tubes (brazed)	per lb.	1/1⅛	..
c	,, ,, (solid drawn) ..	per lb.	1/1⅛	..
g	Copper Bars (best selected) ..	per ton	£114	£1 inc.
g	Copper Sheet	per ton	£116	£1 inc.
g	,, Rod	per ton	£114	£1 inc.
e	,, (Electrolytic) Bars ..	per ton	£107	..
e	,, ,, Sheets ..	per ton	£115	£1 dec.
e	,, ,, Rod ..	per ton	£112	..
e	,, ,, H.C. Wire	per lb.	1/1	..
f	Ebonite Rod	per lb.	8/6	..
f	,, Sheet	per lb.	8/-	..
n	German Silver Wire	per lb.	1/8	..
h	Gutta-percha, fine	per lb.	5/6 to 6/6	..
h	India-rubber, Para fine	per lb.	4/10½	3½d. inc.
i	Iron, Charcoal Sheets	per ton	£18	..
i	,, Pig (Cleveland warrants)	per ton	57/4	1/2½ inc.
i	,, Forgings, according to size	per ton	From £11	..
i	,, Scrap, heavy	per ton	47/6 to 50/-	..
i	,, Wire, galvanised No. 8 ..	per ton	£9 15	..
g	Lead, English Ingot	per ton	£22 5 to £22 10	£1 17 6 inc.
g	,, ,, Sheet	per ton	£22 12 6	£1 17 6 inc.
m	Manganin Wire No. 28	per lb.	8/-	..
g	Mercury	per bot.	£6 16 to £7	..
d	Mica (in original cases) small ..	per lb.	6d. to 1/-	..
d	,, ,, ,, medium	per lb.	2/6 to 4/-	..
d	,, ,, ,, large ..	per lb.	4/6 to 8/6	..
p	Phosphor Bronze, plain castings	per lb.	1/4½ to 1/6½	..
p	,, rolled bars & rods	per lb.	1/5½ to 1/6½	..
p	,, ,, strip & sheet	per lb.	1/6 to 1/10	..
o	Platinum	per oz.	105/-	5/- inc.
e	Silicium Bronze Wire	per b.	1/3½	..
	Steel, Magnet, acc'd'g to desc'p'n	per ton	£58	..
	,, ,, in bars		£15 to £40	..
g	Tin, Block (English)	per ton	£184 to £185	£6 10 dec.
n	,, Wire, Nos. 1 to 16	per lb.	2/4	1d. inc.
p	White Anti-friction Metals—			
	"White Ant" brand	per ton	£56 to £80	..
k	Zinc, Sh't (Vieille Montagne bnd.)	per ton	£29 5	£1 5 dec.

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, G.P. and Teleg. Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p The Phosphor Bronze Co., Ltd.

Prospectus.—*The Electrical Securities Trust, Ltd.*—This company, among the directors of which are Mr. R. S. Portheim and Mr. A. W. Tait, is offering an issue of £100,000 5 per cent. ten-year debentures at par. According to the prospectus, the company has been formed for the purpose of conducting the business of an investment trust company and for other objects. "The great increase in the construction of electrical undertakings, not only in the United Kingdom but also in foreign countries, has resulted in the issue of a large amount of bonds, debentures and shares of electric lighting, power and traction companies. The directors are satisfied that these securities, when selected with care and discretion, form a safe and remunerative investment, and that at the present time many such securities can be purchased on advantageous terms."

Bournemouth and Poole Electricity Supply Co., Ltd.—The directors have declared an interim dividend at the rate of 5 per cent. per annum on the ordinary shares, less income-tax, for the last half-year. [This is at the same rate as for the same period of last year.]

STOCKS AND SHARES.

Tuesday Afternoon.

Markets are certainly beginning to wear a more healthy appearance, and the turn of the half-year has brought a fair amount of investment business to the Stock Exchange. It would, however, be somewhat remarkable if the House were busy during the period that used, when the sun shone, to be called the dog-days; and, therefore, the markets are not too eager to boast about activity just at present.

Indications of the better feeling that prevails may be noticed in the quiet demand for the Debenture stocks of the Electricity Supply companies. Several improvements have occurred in prices, noticeably in Charing Cross, Midland Electric and County of London issues. The rises are quite small, but they show that the investor is not entirely oblivious to the electricity section, long as he has ignored them.

Come what may to the shares, these debenture stocks are hardly likely to be affected unfavourably by legislation. Behind the majority of the stocks there is still ample margin of security both as regards interest and principal, and it would not be surprising if the better of the issues were to gradually attain the level of values at which the yield would work out to 3¾ or 4 per cent. on the money.

Shares in this department are very little altered on the week. Charing Cross Preference fell to 4. County of London Preference declined ¼, Smithfields fell to 30s. and the hapless Edmundson's Preference went back to the same price as Smithfields. Proprietors in the Edmundson's Corporation seem content to allow their affairs to drift without obtaining that statement from the directors as to the actual position of the company which ought to have been made after the passing of the Preference dividend. It is said that the board has been strengthened, but some degree of astonishment may be permitted at the supineness of the proprietors in not taking steps to obtain fuller information with regard to their company's concerns.

Calcutta Electric Supply shares are lower in consequence of the proposed increase of capital.

Every week sends City and South London Ordinary stock a little higher, and the price has now reached 47½. Anticipation looks for the coming dividend to be at the rate of 2½ per cent., against the 2¼ per cent. declared last July. The traffics continue to show up very well, but they include, of course, the takings over the new extension. Central Londons are steady. Great Northern and City show no improvement. Underground notes are a point harder on account of the business which the group of Tubes are doing.

Traction shares, on the whole, have remained steady. Anglo-Argentine Preference put on ¼, but except for this, the group is unchanged. British Electric Traction Preference advanced to 7¼. Sellers of British Thomson-Houston Debenture found no ready buyer, and the price had to give way 3 per cent., which reduced it to 91. British Columbia Electric Preferred Ordinary has received useful support.

Telegraph stocks have a brisk rise in Anglo-American Deferred as their feature, the price being merely 2 points higher upon a fresh outbreak of speculative buying. The Preferred and the Ordinary improved more soberly. As a whole, prices are hard in this division, without much quotable change.

Satisfaction at the dividend on National Telephone Deferred stock is reflected in rises in several of the company's issues. The report was read as being decidedly favourable. Oriental Telephones shed their rise of last week, and Marconi's proceeded further on their downward path.

The manufacturing list is very quiet. British Aluminium 7 per cent. Preference went a shade lower, but Dick, Kerr Ordinary at 1½ have improved.

Stock Exchange Notices.—The Committee has ordered the undermentioned securities to be quoted in the Official List:—

British Aluminium Co., Ltd.—2,000 additional ordinary shares of £5 each, fully paid, Nos. 1 to 2,000.

Application has been made to the Committee to allow the following securities to be quoted in the Official List:—

Bruce, Peebles & Co., Ltd.—28,881 ordinary shares of £5 each, fully paid. (Special application.)

National Telephone Co., Ltd.—The directors have resolved, subject to a final audit, to recommend the following dividends for the half-year ending June 30th last, after payment of the dividends on the preference shares: At the rate of 6 per cent. per annum on the preferred stock; at the rate of 6 per cent. per annum on the deferred stock; less income-tax in all cases carrying £130,000 to reserve, and about £10,000 forward. The transfer books will be closed from the 10th to the 23rd inst., both days inclusive, and the dividend warrants will be posted on the latter date. The dividends on the deferred stock for the corresponding period of last year was 5 per cent. per annum, with £120,000 put to reserve and £10,859 carried forward.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1903.	1904.	1905.	1906.	Closing Quotations July 2nd.	Closing Quotations July 9th.	Business done week ended July 9th, 1907. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	3 — 3½	3 — 3½	..	..	..	Nil
149,600	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	Nil	Nil	5 %	5 %	86 — 89 xd	86 — 89	..	..	..	5 12 4
660,660	Anglo-American Telegraph	Stock	61s.	2⅜%	3½%	3⅝%	61 — 64	62 — 65			+1	5 19 3
3,169,670	Do. do. do. 6 % Pref.	Stock	6 %	5½%	6 %	6 %	107⅞—108½	108½—109½	109	107⅝	+ ¾	5 9 10
3,169,670	Do. do. do. Deferred	Stock	2s.	Nil	½%	1⅝%	20 — 20⅛	21¾ — 22¼	21⅞	20⅛	+1¼	7 17 4
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	..	..	5 %	..	100 —1°8	100 —103	..	..	..	4 17 1
44,000	Chili Telephone, Nos. 1 to 44,000	5	7 %	8 %	8 %	8 %	6¾ — 7⅛	6⅞ — 7⅛	6⅛			5 10 4
2,097,680	Commercial Cable Stng. 500 year 4 % Deb. Stk. Red.	Stock	4 %	4 %	4 %	4 %	91 — 93 xd	92 — 94	93½	92½	+1	4 5 1
16,000	Cuba Telegraph	10	0 %	5 %	5 %	5 %	7⅞ — 8¼	7⅞ — 8¼	..	..	..	6 1 3
6,000	Do. 10 % Pref.	10	15 %	10 %	10 %	10 %	15½ — 16½	15½ — 16½	..	..	..	5 19 5
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3⅜ — 3⅝	3⅜ — 3⅝	..	..	..	5 8 6
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8¾ — 9¼	8¾ — 9¼	..	..	..	5 8 1
30,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	98 —101 xd	98 —101	..	..	..	4 9 1
60,710	Direct United States Cable	20	8 %	3½%	4½%	..	15⅞ — 16¼	15⅞ — 16¼	16¼	16	..	5 4 7
57,000	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	98 —100 xd	98 —100	..	..	..	4 10 0
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	135 —140	135 —140	139	137	..	5 0 0
2,000,000	Do. 3½ % Pref. Stock	100	3½%	3½%	3½%	3½%	89 — 91	89 — 91	90	89	..	3 16 11
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	103¾—105½	103 —105	..	..	—½	3 16 2
300,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	7 %	13 — 13½	13 — 13¼	13⅛	13	..	5 3 8
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	104 —106	104 —106	..	..	..	3 15 6
295,400	East & S. Afric. Tel., 4 % Mt. Db., 1 to 3,000, red. 1909	100	4 %	4 %	4 %	4 %	9⅛ —101	98 —101	..	..	..	3 19 3
200,000£	Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	98 —100	98 —100	99⅞	98½	..	4 0 0
181,127	Globe Telegraph and Trust	10	5½%	5⅝%	5½%	5½%	10½— 11 xd	10½— 11	10 7/16	10½	..	5 0 0
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	6 %	13⅜— 14 xd	13¾— 14	14⅛	13⅝	..	4 5 9
150,000	Great Northern Telegraph, of Copenhagen	10	15 %	24 %	24%	20 %	34 — 36	34 — 36	34½	33½	..	5 11 1
28,900	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	98 —100 xd	98 —100	..	..	..	4 10 0
17,000	Indo-European Telegraph	25	10 %	13 %	13 %	13 %	56 — 58	56— 58	..	..	..	5 12 1
$41,380,400	Mackay Companies Common	$100	..	1 %	2 %	3½%	66 — 68 xd	66 — 68	..	..	..	5 2 11
$50,000,000	Do. do. 4% Cum. Pref.	$100	..	4 %	4 %	4 %	67 — 69 xd	67 — 69	..	..	..	5 15 11
256,127	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	1/16 — 1/32	1/16 — 1/32	..	..	— 1/16	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	3 %	4 %	5 %	..	⅛ — 1/16	⅛ — 1/16	..	..	..	4 14 1
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	..	1 — 1	1 — 1				4 9 0
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	108 —110	109 — 111	110	108½	+1	5 8 1
2,225,000	Do. do. Def. Stock	100	5 %	5 %	5 %	5½%	106 —108	108 —110	109½	106½	+2	5 0 0
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	11¼— 13½	11¼— 13½	..	..	..	4 8 11
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	5 %	10 — 12	10 — 12	..	..	..	4 3 4
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅜ — 5½	5 7/16 — 5 11/16	5½	..	+ 1/16	4 7 11
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	94 — 96 xd	94½ — 96½	95⅝	..	+2	3 12 6
1,669,593	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	99 —101	100¾—102¾	101	99½	+2	3 18 1
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	6½%	6⅝%	7 %	7 %	1 7/16 — 1 7/8	1 7/16 — 1 7/8	..	..	— 1/16	5 1 10
50,000	Do. do. do. 6 % Cum. Pref. ..	1	6 %	6 %	6 %	6 %	1 7/16 — 1 7/8	1 7/16 — 1 7/8	25/6	..	..	4 11 5
100,000	Do. do. do. 4 % Red. Deb. Stock ..	100	..	..	4 %	4 %	93 — 96 xd	93 — 96	..	..	..	4 3 4
100,000	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	97 —100 xd	97 —100	..	..	..	4 0 0
11,839	Reuter's	8	5 %	5 %	5 %	5 %	7½— 8¼	7½— 8¼	7⅞	..	..	4 14 1
60,000	Telephone Co. of Egypt, 4½ % Deb. Red.	100	..	..	4½%	4½%	98 —101 xd	97 —100	..	..	—1	4 10 0
3,167	Submarine Cables Trust	Cer	6 %	6 %	6 %	6 %	127 —130	127 —130	..	..	..	4 12 4
80,000	United River Plate Telephone	5	8 %	8 %	8 %	..	6¾— 7⅛	6¾— 7⅛	..	..	..	5 10 4
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	..	5 — 5⅛	5 — 5⅛	5 1/16	..	..	4 10 11
15,607	West African Telegraph, Shares	10	4 %	4½%	4 %	4 %	10 — 10½	10 — 10½	..	..	..	3 16 2
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2	Nil	Nil	Nil	2½%	1¼— 1⅜	1¼— 1⅜	25/-	23/9	..	3 12 9
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	97 —100 xd	99 —102	99⅜	..	+2	3 18 5
207,930	Western Telegraph, Ltd., Nos. 1 to 207,930	10	7 %	7 %	7 %	..	13⅜— 14¼ xd	13⅜— 14¼	14⅜	13¹¹/₁₆	..	4 19 1
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	100 —103 xd	100 —103	..	..	..	3 17 8
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	⅛ — ¼	⅛ — ¼	10/-	..	..	Nil
34,563	Do. do. 6 % Cum. 1st Pref.	10	7 %	6 %	5 %	8 %	7⅞ — 7⅞	7¾ — 7⅞	7⅞	..	— ⅛	10 6 5
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	Nil	Nil	6½ — 7⅛	6¾ — 7⅛	..	..	..	Nil
80,000£	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100 —103 xd	100 —103	100½	..	..	4 17 1

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

270,000	Anglo-Argentine Trams, Nos. 260,008 to 510,007, and 560,008 to 580,007	5	..	8 %	8 %	8 %	8 — 8¼	8 — 8⅛	8⅝	8⅞	..	4 14 1
260,007	Do. 5½ % Cum. Prefs., 1 to 260,007 ..	5	5½%	5½%	5½%	5½%	5⅞— 6	6 — 6¼ xd	6 1/16	5⅞	+ ⅛	4 8 0
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	131 —134 xd	131 —134	..	..	..	4 9 7
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	102 —105 xd	102 —105	..	..	..	4 15 8
890,000	Babcock & Wilcox, 1 to 530,000	1	17 %	20 %	20 %	20 %	3¾— 4	3¾— 4	77/6	75/7½	..	5 0 0
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1⅛— 1½	1⅛— 1½	28/9	..	..	4 0 0
38,000	British Aluminium, Ord., 2,001 to 40,000 ..	5	..	7 %	7 %	7 %	5 — 5⅛	5 — 5⅛	..	..	..	6 7 3
40,000	Do. do. 7 % Cum. Pref.	5	Nil	7 %	7 %	7 %	5⅛— 5¼	5⅛— 5¼	..	..	— ⅛	6 1 9
20,000	Do. do. "A" 6 % Cum. Pref.	5	Nil	6 %	6 %	..	5⅛— 5¼	5⅛— 5¼	..	..	..	5 4 4
20,000	Do. do. 4 % Funding Certs.	5	..	4 %	4 %	4 %	3⅞— 4⅛	3⅞— 4⅛	..	..	..	4 14 1
258,000	Do. do. 5 % 1st Mort. Deb. Stock Red.	Stock	5 %	5 %	5 %	..	100 —103	100 —103	99	..	..	4 17 1
300,000	Do. do. 5½ % Loch Leven Debs. ..	100	..	..	..	5½%	98 —101	98 —101	99½	..	..	5 8 11
400,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	6 %	6 %	120 —125	120 —125	124½	..	..	4 16 0
300,000	Do. 5 % Pref. Ord. Stock	100	5 %	5 %	5 %	5 %	105 —109	107 —111	109	..	+2	4 10 1
300,000	Do. 5 % Cum. Perp. Pref. Stock ..	100	5 %	5 %	5 %	5 %	103 —107	103 —107	105½	..	..	4 13 6
238,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250 ..	40	4½%	4½%	4½%	4½%	99 —102	99 —102	100½	..	..	4 8 3
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	103 —105	103 —105	..	..	..	4 5 9
133,301	British Electric Traction	10	6 %	6 %	3 %	Nil	2⅜— 3⅛	2⅜— 3⅛	62/6	56/3	..	Nil
161,437	Do. do. 6 % Cum. Pref.	10	6 %	6 %	6 %	6 %	6¾— 7⅛	7 — 7⅛	7 1/16	6⅞	+ ⅛	8 0 0
1,448,658	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	103 —105	103 —106	103½	..	..	4 14 4
410,178	Do. do. 4½ % 2nd Deb. Stock Red.	100	..	4½%	4½%	4½%	78 — 81	78 — 81	80	79	..	5 11 1
100,000	British Insulated and Helsby Cables	5	8 %	8 %	8 %	10 %	6½— 6⅞	6½— 6⅝	6 1/16	..	..	7 8 2
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	5⅞— 6⅛	5⅞— 6⅛	..	..	..	4 16 0
500,000	Do. do. 4½ % 1st Mort. Deb. Red. ..	100	4½%	4½%	4½%	4½%	101 —104	101 —104 xd	..	..	..	4 6 7
212,000	British Thomson-Houston 4½ % 1st Mort. Debs.	100	4½%	4½%	4½%	..	92 — 96	89 — 93	..	..	—3	4 16 9
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	6 %	Nil	Nil	..	1 — 1½	1 — 1½	26/-	23/9	..	Nil
1,016,353	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	55 — 60 xd	55 — 60 xd	57/3	..	..	6 13 4
50,000	‡Browett, Lindley & Co., Ord.	£1	Nil	Nil	Nil	..	⅝— 11/16	⅝— 11/16	..	..	..	Nil
50,000	‡ Do. do. 6 % Cum. Pref.	£1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
105,731	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	Nil	Nil	2½%	Nil	¼— ⅜	¼— ⅜	..	..	..	Nil
150,000	Do. do. Non-cum. 6 % Pref.	2	6 %	6 %	6 %	Nil	1⅛— 1⅜	1⅛— 1⅜	..	..	..	Nil
125,000£	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	88 — 91	88 — 91	..	..	..	4 18 11
125,000£	Do. do. 4½ % Perp. 2nd Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	71 — 74 xd	71 — 74	..	..	..	6 1 7
100,000	Buenos Ayres & Belgrano, 1 to 100,000	5	3 %	4 %	3 %	3 %	4⅛— 4⅜	4⅛— 4⅜	83/9	81/3	..	3 9 7
40,000	Do. do. "A" 6 % Cum. Pref., 1 to 40,000	5	6 %	6 %	6 %	6 %	4⅜— 5⅛	4⅜— 5⅛	..	..	— ⅛	5 14 3
27,500	Do. do. "B" do., 1 to 27,500	5	6 %	6 %	6 %	6 %	4⅜— 5⅛	4⅜— 5⅛	..	..	..	5 14 3
13,200	Do. do. 5 % Deb. Stock	100	5 %	5 %	5 %	5 %	105 —115 xd	105 —115	..	..	..	4 6 11
190,000	Do. do. 5 % 2nd Deb. Stock	100	5 %	5 %	5 %	5 %	100 —103 xd	100 —103	..	..	..	4 17 1
137,610	Calcutta Trams, 1 to 137,610	5	6 %	8 %	8 %	8 %	7⅛— 7⅜	7⅛— 7⅜	7⅛	7⅛	..	5 3 3
30,000	Do. 5 % Cum. Pref., Nos. 1 to 29,330.	5	..	..	5 %	5 %	5⅛— 5⅜ xd	5⅛— 5⅜	5 5/16	5⅛	+ ⅛	4 6 11
350,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	101 —105	102 —105	103	..	+1	4 4 11
35,000	Callender's Cable Construction shares	5	12½%	12½%	15 %	15 %	9⅛ — 10⅛	9⅛ — 10⅛	10	..	..	6 18 4
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5⅜— 5⅝ xd	5⅜— 5⅝	..	..	..	4 8 11
300,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	105¼—107¼ xd	105¼—107¼	..	..	..	4 3 9
491,222	Cape E. Trams., 1 to 491,222	1	10 %	5 %	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	4 %	4 %	6 %	8 %	1 7/16 — 1 11/16	1 7/16 — 1 11/16	25/7½	25/6	..	6 1 11
224,988	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	..	97 —102	97 —102	..	..	..	4 8 3
911,568	Central London Railway, Ord. Stock	Stock	4 %	4 %	4 %	4 %	73 — 75	73 — 75	75	..	..	5 6 3
544,216	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	92 — 94	92 — 94	..	..	..	4 5 1
544,216	Do. do. Def. do.	Stock	4 %	4 %	4 %	4 %	53 — 56	53 — 56	54	..	..	7 2 10
1,480,000	City and South London Railway	Stock	2⅜%	2½%	1⅞%	2½%	44 — 46	47 — 49	47⅞	47⅜	+3	4 6 9
85,000	Crompton & Co., Nos. 1 to 85,000	3	2½%	2½%	2½%	..	1½— 2 1/16	1½— 2 1/16	37/6	36/10½	..	3 14 0
100,000£	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	93½— 96½ xd	93½— 96½	..	..	..	5 3 8

* Unless otherwise stated, all shares are fully paid. † A period of nine months. ‡ From Manchester Share List.

(Continued on next page.)

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years.				Closing Quotations July 2nd.	Closing Quotations July 9th.	Business done week ended July 9th, 1907.		Rise + or Fall —	Present Yield per cent.
		*	1903.	1904.	1905.	1906.			Highest	Lowest.		£ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	..	10 %	10 %	..	1⅝— 1¹³/₁₆	1⅝— 1⅝	..	..	+ 1/16	6 3 1
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	..	1 — 1	1 — 1¼	23/11½	..	..	4 16 0
294,150	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	100 —103 xd	100 —103	..	..	..	4 7 5
60,000	Dublin United Trams. (1896), 1 to 60,000	10	5⅝%	6 %	6%	..	13½ — 14½	13½ — 14½	..	..	..	4 2 9
59,987	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	..	13 — 14	13 — 14	..	..	..	4 9 3
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	Nil	2¾%	4½%	..	1⅛ — 1⅜	1⅛ — 1⅜	15/-	..	..	9 1 10
17,189	Do. "A" shares, 01—017,189	5	Nil	2¾%	4½%	..	2¼ — 2⅜	2¼ — 2⅜	..	..	..	8 6 9
319,475	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	83 — 86 xd	83 — 85 xd	..	..	..	4 14 2
72,220	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	89 — 92	89 — 92	..	..	..	5 8 8
112,100	Electric Contruction, 1 to 112,100	2	4 %	Nil	Nil	..	⅛ — ¼	⅛ — ¼	..	..	..	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390	2	7 %	7 %	7 %	..	1¼ — 1½	1¼ — 1½	..	..	..	8 0 0
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	4 %	5 %	5 %	5 %	8 — 8½	8 — 8⅝	..	..	..	5 17 8
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	92 — 95	92 — 95	..	..	..	5 14 3
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	3 %	4 %	4 %	4 %	2 — 2½	2 — 2½	..	..	..	20 0 0
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	7 %	10¼ — 10⅝	10¼ — 10¼	..	..	..	6 13 4
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	1 xd —103	102 —103	..	..	..	4 17 1
200,000	Henley's (W. T.), Telegraph Works, Ord.	5	15 %	15 %	15%	15 %	11½ — 12½	11½ — 12½	11½	..	..	6 0 0
200,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 5⅛	5 — 5⅛	5	..	..	3 17 3
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	105½—107½	105½—107½	..	..	..	4 3 9
50,000	India-Rubber, Gutta-percha & Telegraph Works	10	10%	5 %	10%	10 %	15 — 16	15 — 15	15⅝	..	..	6 5 0
37,500	†Liverpool Overhead Railway, Ord.	10	1⅜%	1½%	Nil	Nil	1⅝ — 1⅞	1⅝ — 1⅝	..	..	..	Nil
10,000	† Do. do. Pref., £10 paid	10	5 %	5 %	5 %	5 %	6½ — 7⅛	6½ — 7⅛	..	..	..	6 13 4
600,070	London United Trams. (1901), 1 to 50,007	10	8 %	6 %	3 %	3 %	6¼ — 7⅛	6½ — 7⅛	..	..	..	8 8 7
399,930	Do. do. 60,008 to 100,000	10	8 %	6 %	3 %	3 %	6⅜ — 7⅛	6½ — 7⅛	..	..	..	5 2 2
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	5 %	7⅝ — 8⅞ xd	7⅝ — 8⅞	7 1/8	..	..	5 14 3
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	85 — 89 xd	84 — 88	85	..	—1	4 10 11
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	3/16 — 1/4	3/16 — 1/4	18/6	..	..	4 12 9
350,000	Do. do. 4½ % Deb. Stock Red.	100	..	4½%	4½%	4½%	94 — 97 xd	94 — 97	94½	94	..	4 10 11
30,000	Peebles (B.) & Co., 6 % Cum. Pref., 20,001 to 50,000	5	..	6 %	6 %	6 %	3⅞ — 4⅛	3⅞ — 4⅛	..	..	..	7 1 2
245,500	Potteries E. Trc.	1	5 %	5 %	4 %	4 %	3/16 — 1/4	3/16 — 1/4	..	..	..	6 8 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	3/16 — 1/4	3/16 — 1/4	..	..	..	6 13 4
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	95 — 98	96 — 98	96½	95	..	4 11 10
37,350	Telegraph Construction and Maintenance	12	20 %	15 %	15 %	15 %	31½ — 32½	31 — 33	32¾	32½	+ ½	5 9 1
150,000£	Do. 4 % Ded. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	99 —102 xd	99 —102	..	..	..	3 18 5
599,200	Undergd. E. R., Lon., 5 % Profit Shar. S. Nts.	..	..	5 %	5 %	5 %	61 — 64	62 — 65	..	..	+1	7 13 10
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	5	3 %	Nil	Nil	..	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	Nil
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	6 %	Nil	Nil	..	3½ — 3¾	3⅜ — 4	..	..	+¼	Nil
246,574	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	77 — 81	77 — 81	..	..	..	4 18 9

ELECTRICITY SUPPLY COMPANIES.

14,000	Bromley (Kent) E.L. & P., 1 to 14,000	5	5 %	5⅓%	5⅓%	5⅓%	4⅞— 5⅛	4⅞— 5⅛	..	..	..	5 4 9
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	£8 —100	98 —100	..	..	..	4 10 0
29,798	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10 %	10 %	10%	7⅞ — 8⅛	7⅞ — 8⅛	..	..	..	6 1 3
10,202	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	7⅛ — 7⅝	7⅛ — 8⅛	..	..	..	4 2 4
336,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	99 —102	99 —102	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	8 %	8 %	5 %	5 %	3 — 4	3 — 4	65/-	..	..	6 5 0
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4 — 4½	3⅜ — 4⅛	..	..	— ⅛	5 5 11
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3⅝ — 4⅛xd	3⅝ — 4⅛	77/6	..	+ ⅛	5 5 11
427,400	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	94 — 97 xd	95 — 98	97½	..	+1	4 1 8
49,436	Chelsea Electricity Supply, Ord.	5	5⅓%	6 %	6 %	4⅔%	3¾ — 4¼	3¾ — 4¼	..	..	..	4 14 9
175,000£	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	101 —104 xd	101 —104	104	102½	..	4 6 7
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	5 %	6 %	6 %	6 %	9 — 10	9 — 10	9⅝	9½	..	6 0 0
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	11½ — 12½	11½ — 11½	..	..	..	4 18 0
400,000£	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	120½—123½xd	120½—123½	..	..	..	4 1 0
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	95 — 98 xd	95 — 98	..	..	..	4 11 10
40,000	County of Durham Electrical Power, Ord.	5	4 %	£3 7 0	4 %	4 %	4¼ — 5	4½ — 5	..	..	..	4 0 0
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	4⅝ — 5	4½ — 5	..	..	..	5 0 0
40,000	County of London Electric Lighting, Ord. 1—40,000	10	4 %	4½%	5 %	5 %	7⅜ — 8⅛	7¼ — 8⅛	7⅛	..	— ¼	6 1 3
40,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10½ — 11⅛	10¼ — 11¼	11	..	..	5 4 4
400,000£	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	104 —107 xd	106 —1.9	107	106¼	+½	4 2 7
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	93 — 96	93 — 96	94½	..	..	4 13 9
80,000	Edmundson's Electric Corporation, Ord. Shares	5	7 %	7 %	4 %	..	¾ — 1	¾ — 1	10/-	..	..	11 0 0
80,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	..	1¼ — 2½	1 — 2	30/-	27/6	— ½	15 0 0
350,000	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	78 — 83	78 — 83	..	..	..	5 0 0
10,000	Folkestone, 1 to 10,000	5	5⅓%	5⅓%	5⅓%	5⅓%	4⅞ — 5⅛xd	4⅞ — 4⅞	..	..	..	5 8 5
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	..	..	5 %	5 %	5 — 5½	5 — 5½	..	..	..	4 15 3
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
13,000	Hove, 1 to 13,000	5	8⅓%	8⅓%	9 %	9 %	6⅞ — 7⅛	6⅞ — 7⅛	..	..	..	6 4 2
21,000	Kensington and Knightsbridge Electric Ord.	5	12½%	12 %	10 %	10 %	8¾ — 9⅛	8⅝ — 9⅛	..	..	..	5 0 0
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	97 —100	96 — 99	..	..	—1	4 5 1
111,000	London Electric Supply Corporation, Limited, Ord.	3	Nil	3 %	4 %	4 %	1⅞ — 2⅛	1⅞ — 2⅛	40/-	..	..	5 6 8
70,000	Do. do. do. 6 % Pref.	5	6 %	6 %	6 %	6 %	4⅛ — 5⅛	4⅛ — 5⅛	5⅛	..	..	5 17 1
374,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4 %	4½%	93 — 96	93 — 96	..	..	..	4 13 9
200,000	Metropolitan Electric Supply, 1 to 100,000	5	8¼%	10 %	10 %	8 %	5⅞ — 6⅞	5⅞ — 6⅞	..	..	..	5 14 3
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅜ — 5⅛xd	4⅜ — 5⅛	..	..	..	4 5 9
220,000£	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	103 —107 xd	103 —107	..	..	..	4 4 1
250,000£	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	86 — 91 xd	86 — 91	..	..	..	3 16 11
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	93 — 96 xd	95 — 9d	..	..	+2	4 11 10
67,991	Newcastle-on-Tyne	5	8 %	8 %	8 %	8 %	7¾ — 7¾	7¾ — 7¾	..	..	..	5 3 3
75,000	Do. 5 % Pref., 1 to 75,000	5	5 %	5 %	5 %	5 %	5 — 6	5 — 6	..	..	..	4 3 4
10,852	Notting Hill Electric Lighting	10	6 %	7 %	7½%	7½%	12 — 13	12 — 13	..	..	..	5 15 5
20,000	Oxford, 1 to 96 and 407 to 20,310	5	6⅔%	7 %	7 %	7 %	6 — 6½	5½ — 6½	..	..	— ½	5 12 0
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	96 — 98	96 — 98	..	..	..	4 1 8
40,000	St. James' and Pall Mall Electric Light, Ord.	5	14⅓%	14⅔%	12½%	10 %	8 — 9	8 — 9	8½	8 1/16	..	5 11 1
20,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %	6¾ — 7⅛	6⅝ — 7½	..	..	..	4 13 4
150,000£	Do. do. 3½ % Deb. Stock Red.	100	3½%	3½%	3 %	3½%	86 — 91 xd	86 — 91	89	88½	..	3 16 11
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	4 %	4 %	Nil	1¼ — 2¼	1 — 2	20/-	..	— ¼	Nil
50,000	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	73 — 77	73 — 77	..	..	..	5 3 11
65,000	South London Electricity Supply, Ord.	5	3 %	4 %	4 %	3 %	1⅝ — 2⅛	1⅝ — 2⅛	41/3	..	..	6 13 4
120,000	South Met. Elec. Lt. & Power, Ord.	1	Nil	Nil	2⅛%	2⅛%	⅝ — ¾	⅝ — ¾	..	..	..	3 6 8
117,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1⅜ — 1⅝	1⅜ — 1⅝	..	..	..	5 1 10
200,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	1⅞ — 2⅛	1⅞ — 2⅛	..	..	..	11 2 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	2 — 3	2 — 3	50/-	49/4½	..	8 6 8
200,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	..	4½%	4½%	4½%	94 — 97	94 — 97	..	..	..	4 12 9
110,000	Westminster Electric Supply, Ord.	5	13⅓%	14 %	13 %	12 %	9 — 10	9 — 10	..	..	..	6 0 0
81,279	Do. do. 4½ % Cum. Pref. (Original 5 %—Red. to 4½ % from 31st Dec., 1905)	5	5 %	5 %	5 %	4½%	5⅛— 5⅜ xd	5⅛— 5⅜	..	..	..	4 0 0

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange.

Bank rate of Discount 4 per cent., April 25th, 1907

THE ENGINEERING CONFERENCE.

(*Continued from page* 38.)

A System of Audible Signalling on Railways.

In the absence of the author, Mr. W. Dawson, his paper on "A System of Audible Signalling on Railways" (Section I.—Railways. Thursday, June 20th, 1907), was read by Mr. Jacomb Hood, who also opened the discussion. The paper was criticised in our issue of June 21st. The essence of the invention described is a light sloping arch of timber 40 to 60 ft. long, bolted to the sleepers between the rails, and having a bar of T-iron insulated and bolted to the top of the arch. This is struck by a lever under the locomotive, the lifting of which breaks a circuit on the engine and releases a solenoid, thereby opening a small steam whistle to give the distant danger signal. For the all-right signal the bar is electrified from the signal box, and in that case the whistle is not sounded, but, instead, an electric bell is set ringing on the engine. In case of any failure of the circuit electrifying the bar, the danger signal would be given. Apparently the possible failure of the local circuits on the locomotive is a contingency not contemplated. A diagram of connections was shown in the theatre, but was not reproduced in the paper. Whether whistle or bell be sounded, it continues to sound till the driver shuts it off, so that he cannot well ignore it, or forget which signal was given. The main advantage of the system is, of course, that it provides a trustworthy substitute for the visual signal in foggy weather, and avoids the expense and delay associated with the detonator system of fog signals. Further, the signals, being audible, do not interfere with the driver's "look-out" ahead.

Discussion.

Mr. Jacomb Hood, in opening the discussion, referred to the subject as epoch-making. On some such lines visual signals might come to be wholly or partly replaced by audible signals on the locomotive. [Why not by visual signals on the locomotive?] There were signs of possibilities of an enormous move ahead, in spite of the conservatism of railway men. No system was good in every detail at first, but this had, at least, been found to work well in practice. Whether from the point of view of the public safety or from the financial aspect, a reform in signalling was wanted, and behind the immediate question there was the great question of automatic signalling. The L. and S.W. Railway spent thirty thousand a year in maintaining signals alone, which came to ⅓ of a penny per train-mile. Thus the importance of the economy of a system which saves expenses in signalling, was very great. Details apart, the discussion would turn on visual *v.* audible signals.

Mr. Alex. Ross said that the question interested railway men very deeply. They would, however, be cautious in adopting a system which would be disorganised should the impact shatter the apparatus and cause failure. It was easy to stop an engine; but the driver wanted to know when to start again and where he was going. No apparatus was really effective unless it could *speak*.

Mr. Alex. Siemens said that his firm was closely connected with that of Messrs. Siemens & Halske, and that they were in the habit of exchanging information. The plan by which the mechanical part of the device gave the danger signal should the electrical part go wrong, eliminated danger. Since the distant signal did not stop the engine, but was only a direction to proceed with caution, the question of re-starting did not occur. The making of an electrical contact was less certain in operation than the breaking. As for the selection of the road, that was made in the signal box, not by the driver, who would not receive the all-right signal unless his own line were clear. Either signal continued till the driver stopped it, and his eyes were not distracted from the visual signals.

Col. Yorke described the invention as the most important development attempted for years past. The Board of Trade had watched it with great interest and with gratitude to the G.W.R. He had seen the system in operation on the Henley branch, and also on the Fairford branch of that line. As for the objection to audible signals in themselves, the detonator was an audible signal, but this had the pull, in that it was on the engine instead of on the rail. To a great extent our lives were regulated by audible signals, such as the striking of clocks, and, one never disregarded, the dinner bell. Fogmen did their duty well, but fogs came on suddenly, and the men were not always immediately available. Fogging apparatus should be in constant use, as it would be on this system. None the less, a duplication of signals was disconcerting to a driver, who got into the habit of observing one or the other in preference. Hence, where one could be depended on in all circumstances, the other might be dropped with advantage. At night it was sometimes difficult to distinguish the red distant signal from the stop signal. This system would differentiate between them. He would not, however, go as far as Mr. Jacomb Hood, who looked forward to the disappearance of *all* semaphores. Drivers should be encouraged to discuss the utility of such apparatus among themselves.

Mr. Jas. Burton thought that the very serious importance of the change as connected with the defects of drivers had not been sufficiently considered. A driver might forget which signal he had received; with a visual signal he could look again, but he could not restart the audible signal. Still, something of the kind was wanted when the visible signals were hidden by fog.

Mr. L. Coath remarked that signalling was just the same as in the forties, save for interlocking devices. The present invention was a practical one, but it did not touch one danger, which had lately been in evidence, the risk of drivers running past the home signal. He had himself devised an automatic system which was free from the objection of carrying batteries on the engine, and by which the brakes were put on automatically. If the driver tried to start again too soon he found his brakes on. Then there was the danger of the apparatus being broken by a blow at high speed, and, since the trigger was under the engine, the driver would not know that it was gone. In his plan the apparatus was overhead where it could be seen, and there was no blow at all.

Mr. Ferreira said that most inventions of this kind failed in the essential point of providing a danger signal in the case of any possible mischance to the apparatus. On this plan, were the trigger carried away the whistle would still sound. The driver had to acknowledge the signal before he could pass on. A modification was now arranged to get rid of batteries on the engine. The plan satisfied the necessary conditions and provided a satisfactory way of carrying them out.

Mr. Blackall had had practical experience of the system for three years on the Henley branch with no failures. On the Fairford branch there had been no real failures either. Occasionally the whistle had sounded instead of the bell, an error on the side of safety. One distant signal should suffice, if always ready for use. As to the risk of the shoe dropping off, it was about as likely as the loss of a wheel on the engine.

Mr. Marsh called attention to the human element involved. If you gave a man an audible signal you made him careless about the visible one. A driver who knew his line had an instinctive knowledge where to look for the signal, just as a man who knew his house, could put his hand on the handle of the dining-room door in the dark. He cited a system introduced on the Great Northern Railway which worked all right, but which was taken off because the drivers "did not think much *to* it."

Mr. Irvine objected to the ramp. You had always got the rails, but not always the ramp. Why should not the signal be operated electrically from the rails themselves? [He seemed to have forgotten that insulated rails would be required for that purpose.]

The closure was then applied by the Chairman, and, in Mr. Dawson's absence, there was no reply.

Light Railway Policy.

The last paper of Section I was by Mr. William Barrington on "Light Railway Policy." It opens with a complaint that few people know what a light railway is or what it is wanted for; gives a slight sketch of the history of light railway enterprise at home and abroad, and concludes with a comparison of light railways to streams and rivulets, whereas the main lines may be regarded as rivers. Is it reasonable, asks the author, to expect a country to be drained economically by its rivers alone, or its traffic by its main lines only? For the rest, the paper was somewhat rambling and discursive which gave occasion to a no less discursive debate. In parts it was barely intelligible, *e.g.*:—

"As a nation we have been accused of 'muddling through' our wars, and other national enterprises; but there is another expression—'rule-of-thumb,' which probably conveys the idea more accurately." What idea? or what can be the meaning of "the conversion of the 'rule-of-thumb' into systematised and logical principles"?

Discussion.

Mr. Arthur Pain opened the discussion, saying that 3-ft. gauge railways had worked for 25 years, but had not "taken on" here as on the Continent. Luxury in travelling was encouraged by the competition of railway companies, and passengers had been spoilt, and expected the same luxury on light railways. If they did not get it they threatened to write to the manager. A simpler system of land acquisition was also needed [? stealing] if light railways were to be successful, and take the heavy traffic off the road. He cited a case in which £20,000 compensation had been paid by the Government for damage to the roads in connection with the formation of a camp, and, after the damage had been done, the authorities put down a light railway.

Mr. C. O. Burge referred to light railways in Australia. The cost of construction was an important consideration as to the

policy of light railways. In Ireland, light railways cost £4,000 a mile. In Australia, with all the expense of importing the rails, with broad-gauge lines, and with labour at a minimum wage of 10s. a day, the cost was but £1,750 a mile. The main reason was that the cost of land in Australia was practically nothing, and the preliminary expenses were very small there. Why should they not be small here also? The Light Railway Act was intended to reduce them, but had somehow failed in its purpose.

Mr. R. Elliott-Cooper, referring to the difficulty of defining a light railway, said the difference was only in the process by which the necessary powers were obtained. The Railway Commissioners had done a great work. It was not even necessary to employ counsel before them, though, of course, many did. But the Act was abused, and applications were made before the Commissioners for railways that were not for light railways at all. It was a curious anomaly that the Commissioners were not allowed to listen to any proposal which involved competition with an existing line. Consequently, when a line opening new country chanced to have its terminals near any main railways, the very evidence of its convenience was turned against the promoters: "Your own witnesses show that this is a case of competition." Of late, however, the interpretation of the condition had been modified, and regard paid rather to the district as a whole than to the position of the terminals. In Ireland subsidies were granted for the construction of light railways; in Italy, everyone helped the railway construction; but in England everyone tried to hinder it. The cost of junctions with the main lines was considerable, for the light railways acted as feeders to the great railways. There should be no fencing or costly stations; a gravel path would often be sufficient. Economies were also possible at level crossings; only a cattle guard was wanted (that coo again!)—no gates, nor signals, except at junctions. It had never yet been settled how far these economies could be practised. The fate of a light railway was, usually, to be taken over by a main railway and worked on the old system. He held that the powers of the Act should be more used, and that the lines should not be called "light railways," but third category railways, and that they should be worked independently. He referred in particular to a little branch line in Yorkshire, which was worked independently, though N.E.R. trucks ran over the line. It was worked by one engine only, was but five miles long, and was so successful that it had taken the unusual course of paying off its debentures.

Sir Guilford Molesworth criticised the figures in the paper. Cost per train-mile was a delusive basis of comparison; cost per ton-mile was what he wanted. He referred to our Indian railways, because their statistics were more complete than those of our English railways, to prove his point. The costs per train-mile of one of these, as compared with the East Indian Railway, were but 56 per cent.; but per ton-mile they came to 208 per cent. Again, at Festiniog 30 years ago he had found that owing to the dense load (generally slates) the number of tons that could be carried in one truck was so great that it would take eight trucks to carry the same weight of coffee, and more, were the load hay or straw. Here the cost per train-mile would be clearly misleading. Special conditions only would justify deviation from the standard gauge of the country; farmers would rather cart their produce to the nearest main line station then send it by light railway, if they had to break bulk at the junction.

Mr. Jas. Burton had constructed several light railways in England and Ireland. The usual gauge for a light railway was 3 ft. It was not always of the same class, sometimes running beside the road for part of the way, with deviations from it, in places, of several miles in length. The running by the road side was a disadvantage, since it limited the speed too much; so new lines were usually separated from the roads. Powers could be got cheaply from the Privy Council, provided no large railway company was interested to oppose. Government subsidies were granted to light railways in Ireland to an extent that has not occurred in this country. Some three or four of the lines he had been concerned with were working independently of the main lines.

Mr. Noel Radleigh said that extended powers were needed by the Light Railway Commissioners to bring about extensions of the system. Landowners had taken compensation for their land where the light railway had enormously increased the value of their property. Some reform was, therefore, vitally necessary in the terms of land purchase.

Mr. Jacomb Hood said that light railways had not caught on in this country, because most of those made had fallen into the hands of railway companies who did not know how to work them.

The Chairman (Mr. W. R. Galbraith) had been the constructor of the first of our light railways, some time in the sixties. Their main distinctions were a 3-ft. gauge, lighter bridges, and level crossings. The L. & S.W. Railway turned them into heavy railways. Whenever a light railway was proposed, everyone came down on the promoters to spend money.

Mr. Barrington, in replying, said he scarcely expected that the Chairman and Sir Guilford Molesworth would illustrate his remark that people did not know what a light railway was. They both took it to mean a narrow-gauge railway. The gauge might be anything, the real criterion was low speed and small weight on the axles of the carriages. Breaking gauge was made more of a bugbear than was really necessary. As regards the "cost per ton" argument, the railway would only be constructed where there was doubt whether the traffic would support a heavy railway. It was useless to send a 100-ton truck for a 5-ton load. In answer to a question, he said his figures referred to railways which were working independently.

The Chairman then announced that the work of the section was concluded.

(To be continued.)

TRADE REQUIREMENTS OF INDIA.

[COMMUNICATED.]

Those engaged in electrical trade in India constantly remark on the apparent lack of knowledge of India and its requirements by the home manufacturers, and on occasions actually suffer considerable loss through mistakes caused by this ignorance. Perhaps, therefore, a short outline of the daily routine work and business transacted may be of some assistance to the general body of manufacturers and prevent possible future mistakes.

In India, the serious electrical business is confined to Calcutta and Bombay, though with the advent of electric light in Madras, new electrical firms are certain to crop up. Of course, in other large towns and cities such as Cawnpore, Lucknow, Delhi, Lahore, branch offices from Calcutta and Bombay firms may be seen, and all over India are to be found a lot of native firms who do business in any line which may offer itself, and these latter buy almost wholly from Calcutta and Bombay, and in many cases obtain lessons in electrical work at the same time, for scarcely any of them have any electrical knowledge whatever.

Of large electrical firms who import to any extent, it may be said that Calcutta has only a bare dozen and Bombay still fewer. These concerns are almost wholly old-established firms carrying on a large general business, and they only took up electrical work on its advent to India some eight to ten years back, but their names are known throughout India.

Before going further, a word about competition may be a key to some later statements, and, in fact, competition is a dreadful skeleton to all in the trade, and influences every transaction to a really harmful extreme. The leading firms being so few in number and their names all equally well known, scarcely any mofussil inquirer fails to send the same inquiry to all the firms, and as there is no trade alliance of any nature, all firms are aware that those who are satisfied with the smallest profit, or have managed to secure a stock of a particularly cheap line, will secure the order.

Money is far more to the native purchaser than it is to people at home, and added to this, a great ignorance or lack of appreciation of quality has tended to flood the stocks of all firms with the cheapest materials that can be obtained, and it is regrettable to state that a very large portion of it is of foreign manufacture, though generally sent out through English houses acting as agents. Unfortunately, it is an impossible task, for the present, and possibly for ever, to change this tendency to buy cheap goods, and the only remedy possible in this country would be for the firms to form a trade society and fix minimum retail rates, but unfortunately there is such a spirit of controversy between the different firms, that there is but small hope of any such society being formed.

The question which most probably will arise at this period is as to the nature of the native demands.

These requirements are what form the bulk of the day's correspondence, and vary from asking for a tender for one incandescent lamp—of course no voltage or candle-power is given—in fact, it is often called simply an "electric candle" or an "electric bulb," to an inquiry as to the cost of lighting up the whole of a small town, the only information given to you being the name of the town, and you are supposed to do the rest and know all the details. The commonest type of inquiry is concerning the cost of working a small factory, a corn mill or mills, chaff-cutting machines, or pumping water, and the ignorance exhibited in such inquiries, if it were not for the necessary trouble they always entail, which a firm cannot ignore with impunity, would be extremely amusing and entertaining.

In Calcutta and Bombay such inquiries are almost invariably verbal, and do not give as much trouble as those of the mofussil inquirer, but the trouble with the verbal inquirer is his lack of knowledge of business etiquette, and at every point he will bring up what other firms have said and quoted, and play one firm off against another, and the regrettable controversy amongst the firms puts the best of the game wholly in the hands of the purchaser, to his benefit and to the detriment of sound and remunerative business.

In addition to the native purchaser, there is a larger

purchaser in the European-managed mills and ginning factories.

These mills, cotton and jute, invariably are fitted with electric light, chiefly for insurance reasons. Although they have possibly an installation of 1,200 lights and a crane or pump motor or two, they never see the reason of having an electrical engineer; the ordinary mill engineer is made responsible, and as his work with the mill engines and shafting is exceptionally heavy, and as his knowledge of electricity is nil, he scorns his electric installation, and treats it as an interloper and unworthy of his attention.

However, the day arrives when all the lamps are so inefficient that they are yielding only some 5 c.p. instead of 16 c.p.; then he sends to his office an indent for a large stock of lamps, varying from possibly 50 to 500. The office consists of none but commercial men, and they naturally send to all the firms for tenders, and just as naturally accept the lowest, regardless as to make, efficiency, or quality, and the same remark applies to other stores, such as wires, ceiling roses, cut-outs, shades, and the common types of electrical accessories.

There is one other class of buyer who is sometimes able to place fairly good orders for accessories, and that is the railway companies; they also adopt the same means of putting firm against firm, and accepting almost invariably on price.

The above remarks have been made at length to demonstrate the fact that at the present time, price, and price alone, rules the market, though at the same time it must be said as a warning that it is wrong to send out bad stuff at a low price; it must be reliable, or the firm who export, and the firm who will sell, will jeopardise a reputation which may take them years to build up again.

As an instance, a certain leading firm imported electric fans, and, for one year the firm they were purchased from attempted to cut the cost of manufacture down at the cost of efficiency, and though nearly 1,000 fans were ordered, only about 100 were erected, and of those not one stood the severe climatic conditions of India longer than a fortnight. It must be said to the credit of the exporting firm, that they took the whole burden and loss on their own shoulders, but the effect on the importing firm was really heavier than upon the exporting firm, for they lost a year's business, and the faith of the public in them was seriously shaken. Whilst mentioning fans, it is as well to state that of the odd dozen of cheaper makes sent to India, not one will live for long, and people are, it is pleasing to report, in this direction at any rate, realising that price is not everything.

Before leaving the subject of accessories, it may be well to give a few examples of costs, and in the list below are given prices at which the specified material is actually sold retail to any customer, and the prices are actually published so as to be common property; in the right-hand column are list prices at which equivalent material is sold by the leading dealers in England according to their published catalogues. Of course, prices to commission agents and to the trade here are below the prices mentioned. Prices, for the sake of convenience, are both given in sterling, and, further, it must not be forgotten, that on all material there is an import duty of 5 per cent., and that freight, clearing and landing charges are never under 10 per cent., and on such goods as shades are often as high as 20 per cent., and all risks of breakage is with the importer.

	Indian price. Per dozen.	Home price. Per dozen.
Ceiling roses	4s.	6s.
Eight and 16-c.p. incandescent lamps	9s. 6d.	12s. to 18s.
High voltage cut-outs	2s. 8d.	5s.
Opal shades, 10 in.	4s.	4s. 9d.
Enamelled iron shades, 10 in. ...	3s. 9d.	5s. 3d.
Lamp-holders, pendant	4s. 8d.	6s. 9d.
" standard	4s. 2d.	6s.
Tumbler switches with insulated handle and roller	8s.	11s. 3d.
Counterweight fittings, complete with ceiling rose and pulley	12s.	28s. 6d.
Distributing boards, double-pole in teak cases, glass fronts, 4-way, each	8s. 8d.	10s.

Up to the present no word has been said about plant, and as this is really one of the largest sources of income to electrical engineers, no doubt there will be a certain amount of curiosity on the subject. It is an unfortunate matter to relate, but it is undoubtedly the fault of the Government of India that electrical enterprise in this direction has been sadly checked.

In India the Government refer almost every inquiry for plant or installation to England, and as the Government are usually the promoters of the largest schemes, or the Government have the power of influencing and checking the expenditure on a very large proportion of schemes which otherwise would be left to electrical firms in India to settle, the Indian firms with their stocks and facilities for dealing with orders are quite neglected; in these remarks installations for native States and municipalities and other public bodies are referred to, such as Kashmir, Mussorie, Jammu, &c. In the former such schemes as the Rifle Factory, Ichapur, the gun and carriage works, Jubblepore, Ferozepore Arsenal and several other schemes are intended, and in addition to the above the Government influence the various railway companies and Port Commissioners, and limit their spending power in this country to only a few hundred rupees, and everything costing in excess of such sums must be ordered from home. Thanks to the sound action of the railway board, the powers of local purchase for the railway companies are to be largely increased, and this change will be of great value and assistance to Indian enterprise.

When the requirements of the above are eliminated, it will be seen how little remains for the firms to deal with.

In Calcutta it took nearly five years before a motor load could be obtained, and for the small manufacturers to realise that largely increased outputs and increased economy could be obtained by adopting electricity as the motive force, but once this impression gained a footing in the bazaars, there was an immediate demand for motors.

In Bombay, where electricity has only recently been installed, there is no demand for motors, but the time must come when the advantages of electricity will be appreciated. Unfortunately the supply companies will not do as much as they might to promote a motor load, though Calcutta of late has certainly made handsome concessions for motor loads between the morning and five or six o'clock in the evening.

Bombay has adopted the maximum-demand system, and the first-hour charge of 8d. per unit, whatever the after charge is, quite intimidates a possible consumer.

As to prices obtainable for motors and dynamos, the same trouble arises. It is cheapness, and to secure the market certain firms bring out machines, generally of fairly well known and reliable make, but of extremely high speeds, and to quote for a motor of medium speed against one of high speed means to lose the order. Although troubles arise with high-speed motors, the public have not, as in the case of fans, realised the difference, and are guided wholly by price. If manufacturers only understood the climatic conditions and acted on their judgment, after mature reflection, it is possible, that for the sake of their good name they would advise their representatives or agents to avoid these high speeds. In Bombay it is quite usual to have a temperature during the day of 92° to 95°, with a humidity of 65 per cent. to 75 per cent., and during the monsoons an even higher humidity still; such a climatic condition is hard to realise, but if it only could be, it is certain that many manufacturers would alter their designs for Indian orders very considerably.

A very fair proportion of the business of firms in India is in wiring work, and on this the profits are by no means great, owing very largely to the previously-mentioned reasons; but one hint is necessary, and that is the absurdity of home firms sending out elaborate fittings and accessories. Occasionally a Raja's Palace will require fitting, and for such special occasions it is possible that elaborate fittings will be necessary, but even if they are, they will not be of the kind usually listed; what is in these cases required is something gorgeous, or approaching that way, something that glitters or is full of brilliant colouring.

In ordinary wiring work in European houses, mills, &c., nothing but plain pendants with ordinary holders, twin or workshop flexible, a plain ceiling rose and an E.I. or opal shade is required, and perhaps in special cases a plain polished or bronzed brass canting bracket. Some firms have sent out £100 or £200 worth of ornamental fittings to firms on consignment, and scarcely ever has such an enterprise proved anything but a failure. Cleat work is quite common, and in cases where this system is not adopted, casing in

teak wood supported from the wall by small spacing insulators is adopted.

Now, a word must be said on the trouble experienced by firms in India, troubles which should be easily remedied, but which home firms never seem to think it advisable to endeavour to rectify.

India is over 6,000 miles from the mother country, and to write home and obtain a reply takes, at the very least, five to six weeks, and to cable it costs about 2s. per word. To cable for quotations to a certain specification, or for special quantities, means a lengthy cable, and its cost prohibits its use if a successful tender is to be submitted. This fact seems to be overlooked, and home firms will not, even on a special request, send out fully detailed catalogues with best export trade discounts, and only in the case of a few firms will discounts be quoted at all. There is, it is true, a certain amount of trade reticence in quoting best terms, but such reticence for export is more damaging than protective, and the firm which sends out the best catalogue with fullest specification and full details of price, discount, packing charges and approximate weights, will aways secure the best business.

When inquiries in one day cover, say, a motor-car battery, a large series centrifugal pump, an electro-plating outfit, a motor-generator, and combined oil engine and dynamo with costs of working, with an alternative for a suction gas producer plant and engine, the complete equipment of a printing press with geared drive, a motor-launch, a short electric railway and tramway, and all these are quoted from actual experience, it can be realised what information it is necessary for an Indian firm to have at hand, for it is quite out of the question in many cases to say that you will quote in five weeks' time, and to cable almost any of the above inquiries stating the special conditions would be prohibitive.

What is necessary then, is a greater confidence on behalf of the home manufacturer to the firms abroad, and for them to give the latter every facility for drawing up specifications and tenders. To quote an actual case, a certain influential native chief desired quotations for an electric battery suitable for train lighting, and the only firm asked to tender had but one catalogue of accumulators suitable for this purpose, with full discounts and specification, though they had several of others firms' with insufficient information. They naturally quoted on the former, calculating freight and duty from particulars given, and secured the order and forwarded it to the only firm who had been wise enough to give proper and suitable information. Any firm in India may be picked out, and if their stock of catalogues is examined, scarcely one in twenty will be found with trade export discounts; and as discounts may vary from 5 per cent. to 50 per cent., such catalogues are perfectly valueless, and may be reckoned as so much waste paper.

Another question that is well worth attention is the method of sending out stocks. A home firm brings out a new design and anticipates a large sale, and approaches firms out here to take it up, but the only terms are "cash against shipping documents." This design may turn out a success, but to push it properly a large stock must be held, and to take the risk of locking up a large amount of capital, and of finding a good market, all for the sake of a 5 or 10 per cent. profit, whilst the manufacturer makes his certain 20 per cent. or 25 per cent. without any risk, and in addition has the advantage of the goodwill of the Indian firm's name, is scarcely fair, and in fact is scarcely ever accepted. It is quite easy to ascertain the standing of any Indian firm which the home manufacturer wants to engage to push his special line, and in return for that firm's goodwill and the work entailed, it appears only fair that the manufacturer should take some of the risk and send the goods out on consignment. The best agencies in India are those which are on the consignment basis with monthly or quarterly remittances of sales effected. With such terms a firm will do far more justice than if it had to purchase. In the consignment case, there is no lock-up of capital, a most important factor, and the risks are almost negligible; the firm is only too ready to quote with only 2½ per cent. profit if necessary, whereas in the case of paying against documents it must allow for interest on capital and to make a larger profit to cover risks of bad stock, or stock in which it cannot make a good turnover. This question of consignment is a very important one, and the firm that leads the way in giving financial assistance or alleviation to Indian firms will do well, and its business with India will prosper.

COST OF LIVING IN AUSTRALIA.

By J. H. DAVIES.

Speaking generally of Australia, there has not yet been so much electrical work done as one might expect in a country of its size and wealth. The greatest amount of engineering work has so far been carried out by civil and mining engineers, but this immense country—25 times the area of the British Isles, and embracing such a range of latitude that every known tree and cultivated plant will grow well there—is rapidly developing. Those who know best foretell an era of great industrial and commercial prosperity to come shortly. With this, and as a part of it, will be an increased demand for able and versatile electrical engineers—and no man who believes in himself need then refuse to go to Australia for fear of finding insufficient scope for his talent. But, at present, most of the electrical work is on the lighting and tramway systems of the biggest cities, and in connection with mining undertakings. It therefore follows that the electrical engineer will generally live in centres of considerable population. As all the large cities and mining towns, excepting those in the Broken Hill and in the Kalgoorlie districts, are approximately near the coast (within 150 miles of it), they are subject to very similar conditions, and living expenses are much the same in them all.

It is mentioned in the "Handbook of the Australian States"—which is a Government publication, and not issued by someone with an axe to grind—that the purchasing power of money is greater in Australia than in any other part of the civilised world. To few is it given to try what can be got with money in many countries; but the opinions of several men, capable to judge, and who have lived in different parts of the globe, confirm the assertion.

All English and tropical fruits and vegetables grow plentifully; and meat, as one would expect, is very cheap. In the eastern States the average price of foodstuffs is 20 per cent. lower than in this country. For the same class of comfort as obtained in England, board and lodging costs 10 per cent. less. Young men usually live with private families, sharing every advantage of the home life. The "furnished sitting-room and bedroom, cooking, attendance, &c.," can be had at the same price as here. It is not, however, popular—possibly because as in most other lands there is the servant difficulty.

The writer has been almost surprised to find his private opinion about clothes exactly endorsed by others qualified to know. Prices paid for suits are 20 per cent. higher in Australia; but better value is generally obtained for the money, either because materials and workmanship are superior, or because the bright climate is usually not very hard on clothing. Taking into account the better wear got out of clothes, perhaps there is not any real difference in the cost. Sir William Lyne, the Minister of Customs, while here for the recent Imperial Conference, was reported to have said that clothes are more expensive in this country, and that he would have to pay £1 more for his overcoat than at home. Soft washing shirts and collars are commonly worn in summer; the vest often being discarded for a silk waist belt. Laundry work is good and cheap. There is no difference in the price or quality of boots. It is not worth while to take any but an ordinary stock of clothes. These had better not be very heavy, and some should be light-coloured for summer wear. Headgear is rather more expensive, relatively to English prices, than clothes; and 5s. or 10s. will be saved on a panama hat bought at this end, if the owner wears it enough on the voyage to give it a sufficiently second-hand appearance for it to pass the Customs department duty free.

House rent is, on the average, lower than here, being highest in the largest cities; but people spend about the same amount and live in rather better houses. Flats are

not at all common. A great many people own their own houses. The principal cities are excellently served by tram systems, and by rail, on which, by the way, there are only two classes of carriages. Second-class fares are about 1d. per mile. Season tickets are issued at low rates; and practically everyone lives quite out in the suburbs, much as London people do.

Medical expenses certainly would seem to be high. The idea of consulting a doctor for 2s. 6d. would be considered quite a joke, for the minimum fee for all but specialists is 10s. But against this must be put the general immunity from illness, due to the splendid bracing climate. Epidemic diseases, such as small-pox, have never got any hold in the country. The death-rate is scarcely more than half of what it is for Great Britain.

The extreme south of Queensland, New South Wales, Victoria, South Australia (without the Northern territory),

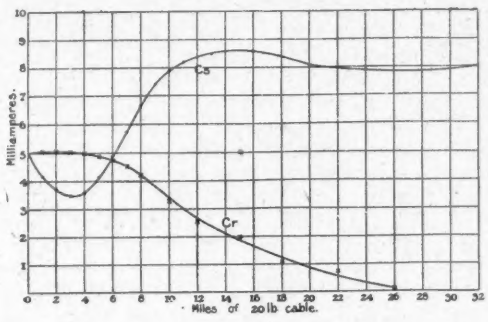


FIG. 8.

and Tasmania, may all be put in one general class where the lowest cost of living, as above cited, obtains. For Queensland, north of Brisbane, Mount Zeehan in Tasmania, and Western Australia about 25 per cent. extra should be allowed. For the Broken Hill and the Kalgoorlie districts the writer, who has never had the fortune to visit them, would add 60 per cent. to the rates for the most favoured parts of the continent—but, perhaps, someone with actual recent experience will tell us exactly about them. A great deal of electrical work has been done on these important groups of mines, and there is every prospect of considerable extension.

It will, perhaps, be of interest to mention that cycles and motors cost about 30 per cent. extra on English prices. Horses are of the best, and half the price that they are here.

Strictly speaking, Australia is not a place where less money will suffice for one than in England. A higher standard of comfort is the rule in every class of life—if this democratic country can be said to be divided into classes. Class of life, which is determined by the amount of money earned and available for spending, is what is meant.

From wireman's mate to chief engineer, speaking generally, all men are paid 30 to 50 per cent. more than in England; and those who contemplate going out should remember that the common standard of life makes this necessary. No one should go on the chance of getting into something. It would be absolute folly to do so. England is a far better place to be out of work in, because more men are wanted here.

On the information given in the previous articles of this series Australia compares most favourably with South America, Egypt, South Africa, and India. The gentleman who wrote about Brazil, and suggested that first consideration should be given to "British possessions," made an excellent suggestion. The writer would say, "other parts of the British Empire." There is no part of the Empire, though Canada and New Zealand may be equally inviting—no part of the world with so much to offer to Englishmen. Australia is a white man's country, without either foreign or alien race problem, and as British as Yorkshire in England is. Capable men will be well advised to go out under engagement; but the time to go "on spec" is not yet.

It is perhaps not commonly known that each State is represented in London by an Agent-General, who is pleased to supply free information to interested inquirers.

PROCEEDINGS OF INSTITUTIONS.

Telephonic Transmission Measurements.

By B. S. COHEN, Associate Member, and G. M. SHEPHERD.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS, *May 9th*, 1907.)

(*Concluded from page* 39.)

Current Measurements.—The relationship between the currents C_s and C_r at the beginning and end respectively of different lengths of telephone line can be readily measured with two barretters. The relationship is complicated by the addition of terminal impedances at either end of the line. Fig. 8 shows the current relation plotted for various lengths of 20-lb. conductor cable equipped with ordinary telephone instruments at either end.

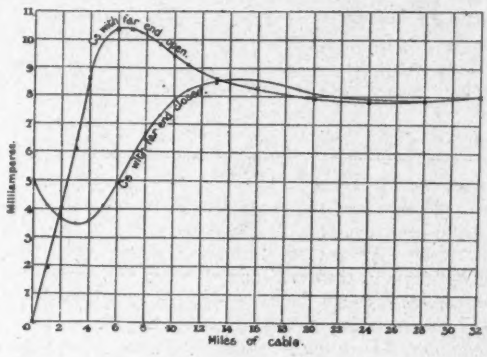


FIG. 9.

It will be seen that up to nearly 6 miles the received current is greater than the sending current. At about 20 miles the sending end current, which has up to this length been mostly increasing, has practically reached a constant figure, and is after this very little affected by any further increase in the length of line.

The necessity for allowing for the action of the terminal apparatus is well emphasised by these curves.

Fig. 9 shows the relationship between the current at the sending end of the line when the receiving end is open and closed for various lengths of line. The cable line used in this case had 20-lb. conductors, and the line was terminated as before at either end by ordinary telephone instruments.

It will be noticed that at about 20 miles and upwards the current flowing into the cable is practically unaffected by the opening and closing of the receiving end, and that this also happens at about 2 miles. The current used for the above tests was at 800 ~, and practically sinusoidal in form.

Determination of Damping Constants on 20-lb. Cable.—This was done by actuating an ordinary telephone transmitting circuit by a steady musical note, and then observing the ratio of sending and receiving currents on a varying length of cable, which could either be shorted at the far end, or closed through a known impedance. The appended table shows the relation found between the actual C_s/C_r, and the hyperbolic function cosh (la), which is the calculated ratio of C_s to C_r (where l is the length of line and a the complex attenuation constant).

Miles.	$\frac{C_s}{C_r}$	~	Cosh (la).	Error.
		Far end short-circuited.		
5	1·065	792	1·0287	−3·5 per cent.
10	1·385	783	1·3740	−0·8 ,,
15	2·310	763	2·3100	0·0 ,,
		Far end closed through impedance 22 ohms 0·15 henry		
10	1·302	792	1·2400*	−4·8 per cent.

* This figure is the ratio of receiving-end to sending-end impedance.

Considering the irregularity in wave-form of a microphone-produced current, the agreement between theory and practice is very fair. The telephone currents actually used were of the order of those commonly observed on standard common battery junction circuits.

By roughly balancing up a treble C singing note, sung into a transmitter, against a sinusoidal alternating current of similar frequency placed direct on the junction at the transmitting end, and then measuring the latter current on the thermo-galvanometer, a general idea of the magnitude of the talking current is obtained.

At the sending end of the line, and at the junction side of the repeating coil, a current of about 5 M.A. and a P.D. of about 3·5 volts was observed. In the receiving instrument secondary, about 2.4 M.A. with 10 miles, 0·53 M.A. with 30 miles, and 0·24 M.A. with 40 miles of 20-lb. cable, were measured. There were local subscribers' loops of 150 ohms resistance in connection with the above circuit.

Sinusoidal Current Producers.—Considerable difficulty has been experienced in obtaining a steady sinusoidal current of the frequencies required for telephone measurements.

The machine used at present is a small inductor alternator, having an armature built up of ordinary slotted stampings, and gives a frequency of 800 ~ at 960 R.P.M. The output is small, but the wave is a very fair one, considering that no special shaping of the teeth was attempted.

Wave Filter.—In order to purify the wave-form for very precise measurements, the peculiar property of the periodic loaded line already referred to and mentioned by G. A. Campbell * in his paper on loaded lines has been utilised. By building up an artificial line, consisting of four or five sections, each associated with a condenser, inductance and resistance coils, it is found possible to practically abolish all upper harmonics and to leave the fundamental frequency desired. A wave filter of this description requires no tuning, and is safe over a considerable range of frequency, but naturally introduces a certain amount of loss.

Power Measurements.—The measurement of the energy absorbed by telephonic apparatus under working conditions presents considerable difficulty. The amount of energy is frequently exceedingly small, perhaps a few microwatts only, and is always a very variable quantity. The hot-wire voltmeter method, due, we believe, to Mr. M. B. Field, was employed with some success.

Some results, using this apparatus, are appended :—

Apparatus tested.	Current	Actual watts.	Apparent watts.	Power factor.	Effective.		~
					L.	R.	
C.B. receiver	0·00695	0·00858	0·01435	0·600	0·0425	165	825
120 ohm receiver ..	0·01160	0·00220	0·02930	0·760	0·0280	165	825
120-ohm receiver and induction coil	0·00290	0·00139	0·00247	0·562	0·0650	227	825
C.B. repeater type 25 C., with 150-ohm subscribers' line ..	0·00208	0·00149	0·00218	0·685	0·0690	320	800

Test of sending-end impedance of 30 miles of 20-lb. paper telephone cable, far end open :—

Current.	Watts.	Power factor.	Phase angle.	Impedance.	~
0·00658	0·0163	0·71	44° 48′	552 ohms	810

This is in good agreement with the theoretical estimate of the impedance of this class of cable, viz., 550 ohms and phase angle 45°. All the above-described tests were made with current supplied by the small inductor alternator previously referred to using its natural wave-form.

The three-voltmeter method was found very convenient for certain measurements of the efficiency of induction and repeating coils. The instrument used was an Ayrton-Mather electrostatic voltmeter having a readable range of about 1-10 volts. An excellent point in favour of this voltmeter in connection with telephonic measurements is its negligible working current. It is a little disconcerting to find that the efficiency of conversion between the primary and secondary circuits of a telephone is of the order of 1 per cent., though when used as an ordinary transformer, at about 800 ~ passing a current of a few milliamperes, the efficiency of the best type of induction coil is quite high, viz., about 72 per cent. The low efficiency in the former case is, of course, due to the large constant component of the current in the primary.

We have also applied the three-voltmeter test to the determination of cable constants at working frequencies. Cables of the ordinary telephone types are notable chiefly for their high copper resistance, very small inductance, and high insulation; consequently the evaluation of the inductance and leakage constants depends on the possibility of very accurate phase measurements correct to a few minutes. This is a matter of considerable difficulty, and the examples given below must be regarded as trial endeavours :—

Line.	Impedance.		R.	C.	S.	L.	~
	End open.	End s.c.					
10 m. 20-lb. Standard	495 – 54° 20′	657 – 29° 18′	82·4	0·0540	$7·12 \times 10^{-6}$	0·00145	750
10 m. 20-lb. Artificial	498 – 51° 28′	644 – 36° 6′	94·0	0·0624	—	0·00020	750

Currents used were from 6 to 10 M.A. with P.D's. of 2 or 3 volts. The figures for resistance and capacity differ very slightly from what would be obtained by direct-current measurements.

The constants L and S in the case of the 20-lb. cable are possibly doubtful, owing to the phase-measuring difficulty referred to, but there is good reason to believe that there is a very considerable reduction in the effective insulation of paper cables at telephonic frequencies. It is hoped that further investigation will lead to more precise results.

Telephone Line Equivalents Obtained by Voice Tests.—The National Telephone Co. were perhaps the first English telephone authorities to obtain any very accurate figures for the relative transmission values of various types of telephone lines.

A series of attenuation constants for all the types of lines in use in this country were calculated in July, 1904, from the now well-known formulæ, taking into account the resistance, capacity, inductance, and average leakage, and the results were embodied in a table of equivalents, taking a 20-lb. low-capacity cable as a standard. The results were experimentally verified in December and January, 1904, and 1905, the method for verifying being a simple one. This table of equivalents has already been published in Mr. Gavey's presidential address.

Talk is transmitted over two lines alternately, using the same telephone instruments for both lines, one of which is a variable standard line and the other the actual line under test. The variable standard, which in the laboratory is an actual telephone cable capable of being varied in length from 0·1 to 52 miles, and which for portable purposes consists of an artificial cable calibrated against the laboratory standard, is adjusted until the talk over both lines as judged by the ear is balanced, and the ratio of length of non-standard to length of standard gives the equivalent. With practice, variations of very small fractions of a mile can be detected.

* *Phil. Mag.*, Vol. V., 1903, p. 313.

Discussion.

Mr. ALBERT CAMPBELL, in opening the discussion, pointed out that the study of linguistic phonetics, a science almost neglected in this country, would probably throw a good deal of light on the oscillograph records of vowels and consonants. He also showed experimentally a rough method of obtaining a quantitative measurement of a note.

Mr. J. E. KINGSBURY laid great stress on the importance of the vowel sound, the consonants being a secondary consideration. His view was that lines and instruments should be developed to transmit the vowel sounds and the consonants would take care of themselves.

Major O'MEARA referred briefly to the value of oscillograph records, such as shown by the authors, to the telephone engineers.

Mr. (now SIR) JOHN GAVEY remarked on the general resemblance between the P.O. oscillograph records and those given by the authors, and asked whether they favoured frequencies of 700 or 1,100—1,600 in practice. Such improvements as had been made in transmission were largely based on mathematics; useful as the mathematics of the telephone was, it was necessary to take into account other factors before either receiver or transmitter could be improved. Telephone instruments had to meet extreme cases, in distinction to most other apparatus; the same instrument might be used for 5 yards or 500 miles. It was interesting to note that experiments, when laying the P.O. telephone cables, showed that inductances spaced 2 miles apart, gave excellent results, which was borne out by the authors' mathematical deductions.

Mr. W. DUDDELL remarked that it was a pleasure to him to see that the authors had used similar methods to those proposed by himself a short time previously, although, of course, they had been at work on the subject for some time. He also exhibited some oscillograph records of various vowel sounds, also a specially prepared record of a song which, he believed, might, in conjunction with the selenium cell, be used for obtaining a reproduction of the song. He considered, from experiments, that the 3-voltmeter method was the best for power measurements at high frequencies (100,000-120,000). The wave filter described by the authors was, in his opinion, the most important instrument described, as it was very difficult to get a good wave form with a very high frequency alternator. As a result of experiment, he came to the conclusion that the iron-wire barretter was preferable to the platinum-wire barretter for measuring small currents, as iron wire could be used without fear of its burning out. Mr. Duddell concluded by further oscillograph experiments on an artificial line.

Mr. J. E. TAYLOR referred to the question of distortion; a great deal of distortion arose from the speaker, and in the microphone diaphragm and receiving instrument. Where very small volumes of sound were used it was necessary to take every care to obtain clear articulation. He remarked that the thermo-galvanometer, although an excellent measuring instrument, was not mentioned by the authors.

Mr. H. LAWS WEBB remarked that our striving after perfection in telephone work had resulted in high standards and costly work. He thought the paper showed that this perfection was not needed; some distortion was admissible. He thought the consonant sound was much more important than had been suggested by Mr. Kingsbury. Some 70 per cent. of the cost of a telephone installation was in the line plant, and he estimated that there was some 13 million pounds' worth of line plant in Britain, so that if investigation of the kind undertaken by the authors, by improving the instrument, led ultimately to a reduction of copper in the line, it would be a great achievement.

Mr. SYDNEY EVERSHED thought that, commercially, lack of articulation was the worst fault of the telephone to-day; but line distortion appeared to be in the way. Phase relationship did not appear to be very necessary to clear articulation.

Mr. ALEX. RUSSELL expressed his appreciation of the authors' barretter, and his disagreement with their statement that the air-cooled transformer was cumbrous and costly—at such high frequencies the cost would be negligible.

Mr. F. TANDY pointed out that we could only ignore distortion within limits, for the limit of commercial speaking on a line was, say, 50 miles, fixed by the distortion of the current on the line. The introduction of inductances improved the wave form, and we were quite right in putting in as much copper as possible, as it was the shape of the current and not the amount which mattered. He considered the consonant very important, as it affected the amplitude in the sound curves.

Mr. D. H. KENNEDY referred to the limiting distances of transmission in practical work; it was possible to speak from London to Inverness, but adding the underground section, say, to Croydon, they got beyond the limits. It was a common thing for commer-

cial firms to transmit, say, 1,200 words in six minutes between London and Paris.

Mr. F. Gill said that the art of telephony had changed in the past few years, and this was not appreciated outside the service. Wave propagation was almost a neglected subject in schools and colleges—the student could bring very little direct knowledge to telephone work, as compared with other branches of engineering. He concluded by mentioning the indebtedness of telephony to Heaviside and others.

Mr. Cohen, in replying to the discussion, remarked that as resonance existed in receiver, transmitter and line, the ear must be a wonderful instrument to distinguish the residual vibrations. He could not agree that the consonant should be neglected, instancing the demands of the Welsh language among others. As regards frequency, he considered the best practice was about 800 average, and 1,500 the highest. Spacing of inductances at 4-mile intervals would give only very indistinct speech. He referred in appreciative terms to Mr. Duddell's work; his oscillograph and thermo-galvanometer had laid the foundations of their measurements. He had used the three-voltmeter method of measurement, but it took a longer time. He noticed that the speakers representing the P.O. service were all strong on articulation, but they were more concerned with trunk work, where articulation was more valuable than in local lines, as mostly considered by the authors, who consider volume more important. He had found trouble from outside disturbances with the thermo-galvanometer. The authors considered the insertion of inductances and study of terminal impedances were the lines on which future investigation would be undertaken.

THE CONTINENTAL ELECTRICAL ENGINEERING INDUSTRY.

The shareholders in the Felten and Guilleaume-Lahmeyer Works Co., at the recent general meeting, approved the report and accounts for 1906, showing an improvement over the trading in the preceding year. According to the report, all the departments were abundantly provided with work, and were taxed almost to the limit of their capacity. The orders received during the year were 25 per cent. greater than in 1905, and the deliveries were 15 per cent. in excess. At the Carlswerk, at Mulheim, the prices realised were not less remunerative than in the previous year; the copper works and copper wire works increased the production by 10 per cent., and the cable factory was more busily employed in all branches than in 1905. The dynamo works at Frankfort received orders for 9,020 machines, of a total of 382,000 H.P., as compared with 7,670 machines, of 252,000 H.P. in 1905, and the deliveries amounted to 8,070 machines, of 265,000 H.P., as against 6,700 machines, of 189,000 H.P. in the previous year. It was impossible to bring the shop extensions into use sufficiently early to favourably affect the results for the past year, and as a consequence, and notwithstanding the working of overtime and night shifts, a large number of orders had to be brought over into the new year. The extensions are now practically completed, but a further enlargement has been put in hand in order to completely dispense with overtime and night shifts. The accounts show the following results:—

	1906.	1905.
Ordinary share capital (paid) ...	£2,600,000	£2,600,000
Obligations	500,000	500,000
Gross profits	751,141	602,646
General expenses	257,915	210,042
Depreciation provision	116,971	90,016
Net profits	356,486	323,816
Dividend, per cent.	11	10

The report states, in connection with the rise in the cost of raw materials and of wages, that it was not always possible to increase the prices of manufactures to a corresponding extent. As to the trade syndicates in which the company is interested, the report mentions that the negotiations for the renewal of the cable syndicate were still in progress, and that the association of electricity firms had contented itself with only advancing by 5 per cent. in the year the 15 per cent. increase introduced in 1905. The company acquired a block of shares in the firm of Escher, Wyss & Co., of Zurich and Ravensburg, for the purpose of obtaining greater freedom of movement in the branch of steam turbines. The Zurich company was in a very favourable stage of development, and had put in hand a large extension of its works. At the end of 1906 the German company had in its employ 10,470 workers, as compared with 9,850 at the close of 1905, and 4,050 of the former were engaged at the dynamo works.

The report of the Norddeutsche Seekabel Werke (North German Marine Cable Works), of Nordenham, which was approved at the annual meeting, states that the works were only fully employed in 1906 from the beginning of June to the end of August, the contract relating to the manufacture of the second German-Norwegian cable ordered by the Government for laying between Cuxhaven and Arendal. Apart from this, the company executed a number of smaller orders by means of about 100 of the original workers who have unconditionally to be retained also during the quiet time. At present the company is engaged on the construction of the cable, the order for which was obtained in severe competition with foreign cable makers, to be laid between St. Petersburg, Libau, and Denmark, for the Great Northern Telegraph Co. of Copenhagen, the total length being about 930 miles. The gutta-percha factory was almost continuously employed throughout the year with orders for "prepared" gutta-percha, in which article the company was everywhere interesting itself with increasing success. During the year the cable steamer *Stephan* was in service for 58 days, and the new cable steamer *Grossherzog von Oldenburg*, which was delivered in January, 1906, was in use for 140 days. The accounts for 1906 showed a surplus of £31,044 on manufacturing, as compared with £169,540 in the preceding year, and one of £2,013 as against £73,350 on cable laying and repairs account respectively. After providing £17,173 for depreciation, as contrasted with £52,933 in 1905, there remained net profits of £3,462, as against £177,900 in the previous year, and a dividend of 5 per cent. has been declared, as compared with 15 per cent. a year ago. The total share capital amounts to £300,000, and is held in equal halves by the German Atlantic Telegraph Co. and the Felten and Guilleaume-Lahmeyer Works Co.

The Akkumulatoren Fabrik Gesellschaft (Accumulator Works Co.), of Berlin-Hagen, which controls the Tudor battery patents, and is the principal accumulator undertaking in Germany by reason of its connections and absorptions, had a largely increased turnover in 1906. The advance in prices which was made in the previous year was far from covering the greater cost of raw materials and the higher wages, and it was only possible to obtain results not inferior to 1905 by utilising all the plant in the most rational way. The financial position may be briefly set forth as follows:—

	1906.	1905.
Share capital	£400,000	£400,000
Gross receipts	300,916	253,858
Depreciation provision ...	39,124	31,221
Net profits	59,464	59,950
Dividend, per cent. ...	12½	12½

The directors' report states that the works in which the company is interested are in a favourable state of development. It was not possible to conclude the liquidation of certain undertakings which had discontinued working, as, for instance, the Pollak Accumulator Works of Frankfort, and the Oberspree Accumulator Works. The ordinary reserve fund amounted to £80,000, and the premium reserve fund for battery maintenance—an insurance fund to limit the cost to customers of the maintenance of batteries—had risen to £144,500. At the end of April the orders on hand represented a value of £95,000 in excess of those on the books at the same time in 1906. Since the report was issued the company is stated to have decided to make an issue of £200,000 in 4½ per cent. bonds so as to deal with the development of business and to float the Brick Transport Co. of Berlin, whose share capital of £150,000 is held entirely by the Accumulator Co. The object of the Brick Company is to transport brick and limestone on the waterways in the vicinity of Berlin, and it has already given an order for 100 accumulator boats for this purpose.

The general meeting of the Land und Seekabel Werke (Land and Marine Cable Works) of Cologne-Nippes, was attended by three shareholders who represented the total paid-up capital of £262,500, thus showing that the undertaking is vested in very few hands. The report stated that both the production and the net profits realised in 1906 were satisfactory, and the primary cause was to be found in the brisk employment of the electrical industry—which, it was added, still continued. Raw materials, and particularly electrolytic copper, reached an unprecedentedly high level during the year, and it was not always possible to obtain compensation in the prices of manufactures. The department for the construction of apparatus was removed in April, 1906, from Hanover to Cologne, and it had developed favourably. The accounts showed net profits amounting to £34,658 as compared with £28,308 in 1905, and a dividend at the rate of 10 per cent. has been declared as against 8 per cent. in 1905. A material increase in orders was brought over into the present year as contrasted with the position of affairs at the beginning of 1906.

The directors of the Akkumulatoren und Elektrizitäts Werke (Accumulator and Electricity Works Co.), formerly Boese & Co., in the course of their report for 1906, state that notwithstanding the continued endeavours made to create a monopoly in the secondary battery trade, the company had experienced an increase in the volume of business and results. Not only so, but the manufacturing profits were greater, despite the dearness of raw materials and the fact that the sale prices were frequently only slightly remunerative. The Altdamm factory, which serves exclusively for the production of stationary batteries, was extended during the year, and the workshops were equipped with machinery and plant for the output of new articles complementing the existing manufactures, including components of motor cars and a light motor-car. The accounts show net profits of £10,856, as compared with £2,875 in 1905. A dividend at the rate of 2 per cent. has been declared on the preference capital, amounting to £222,000, as contrasted with nothing in the three preceding years. No distribution is made on the ordinary capital, which only totals £2,950.

The Continental Co. for Electrical Enterprises, of Nuremberg, proposes to pay a dividend of 3½ per cent. for 1906-7, this being the first distribution for several years. The Electricity Co., late W. Lahmeyer & Co., intends to pay 7 per cent., as in the previous year; the Electra Co., of Dresden, 3½ per cent., as against 2½ per cent.; and the Arc Lamp works of Körting & Mathieson, of Lentzsch, 18 per cent., as contrasted with 12 per cent. in the preceding year respectively; whilst the first year's work of the C. Lorenz Co. (telephone and telegraph works), of Berlin, is represented by a dividend of 10 per cent. On the other hand, the Saxon Works of Dresden, the successor of the former Kummer Co., have not yet reached a paying stage, and this is also the case with

the International Electricity Works and Accumulator Works Co., of Berlin, which was originally formed as far back as 1895.

BELGIAN AND OTHER WORKS.

The directors of the Ateliers de Constructions Electriques de Charleroi state that the orders received in 1906 were of the value of £276,000, as compared with £212,000 in the previous year, and a further increase has taken place this year. Several contracts had already been obtained for the erection of central stations, installations for the transmission of power and for winding engines, and the names of various collieries are mentioned in the company's report, to which some of these works apply. A licence had been obtained to work the Belgian patents for the Ilgner system for the construction of special machines for coal mines and rolling mills. The company had formed in conjunction with two other undertakings, the Société des Ateliers de Constructions Electriques du Nord et de l'Est with a share capital of £800,000, and had transferred its Jeumont works to the new company in return for 6,000 fully-paid shares and a certain number of profit shares. Those works were being largely extended, and the productive capacity was being tripled, and the undertaking was becoming the centre of a group of electrical industries in the district of the Nord. At the side of the works a central station of 10,000 H.P. was rising, and the sale of a large portion of the production was already assured. This station would be started in a few months, together with the cable factory which was expected to have a favourable future. The accounts of the Charleroi Co. indicate net profits amounting to £18,535 for 1906, and a dividend of 10s. per share has been declared on the 17,000 ordinary shares.

The Société Anonyme A.E.G.-Union Electrique, of Brussels, is stated in the report of the directors for 1906 to have largely benefitted by the abundance of business on the market, and the orders received were materially greater than in the preceding year. All the company's departments derived advantage from the favourable situation, and the development of the foreign business was specially noteworthy. However, in consequence of the brisk competition and the rise in the cost of production resulting from the advance in raw materials, the percentage of the gross profits slightly diminished as compared with 1905, but general expenses were kept at the same level notwithstanding the augmentation in the turnover. The net profits realised in 1906 amounted to £10,644, including the balance brought forward from the preceding year, and dividends have been declared at the rate of 5 per cent. on 8,000 shares, 5 per cent. on 2,000 new shares for six months, 3s. 6d. per share on 10,000 capital shares, and 6s. 2d. per share on 10,400 "fractional" shares.

The Compagnie Continentale Edison of Paris, which has a share capital of £400,000, realised gross profits of £186,000 in 1906 as compared with £174,000 in the preceding year. After making provision for depreciation the net profits amount to £69,000 as against £42,000 in 1905. It is proposed to pay a dividend of £2 per share as contrasted with £1 12s. in the previous year.

The Société d'Electro-Metallurgie de Dives, after an interval of five years, has now again been able to pay a dividend—namely, 14s. per £20 share for 1906. A turnover of 9,000 tons of copper was effected as compared with 8,800 tons in 1905, and the net profits reached £58,800 as against £23,600 in the preceding year. A share of £3,000 of the profits was paid to the Compagnie des Métaux, this being the last payment of the kind under the agreement with that company.

The GANZ Electricity Co., of Buda-Pesth, according to the directors' report for the first year's activity, was satisfactorily employed in that period, but the profits were prejudicially affected by the violent competition. After writing off 170,000 crowns for depreciation, the accounts show net profits of 502,797 crowns, which sum enables the payment of a dividend of 5 per cent. The report states that the prospects for the future are not unfavourable and that the agreement with the A.E.G.-Union Electricity Co. had been dissolved by mutual understanding, as it had not responded to expectations.

The Allgemeine-Union Co., of Vienna, realised net profits of 591,479 crowns in 1906, after providing 240,846 crowns for depreciation. A dividend at the rate of 5 per cent. has been declared, as compared with 4 per cent. in 1905.

NEW PATENTS APPLIED FOR, 1907.

Compiled expressly for this journal by W. P. THOMPSON & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool, to whom all inquiries should be addressed.

15,310A/06. "Improvements in or relating to electric arc lamps." C. OLIVER. (Date applied for under Rule 5 of the Patents Rules, 1905, July 5th, 1906.) June 29th.

14,474. "Improved method of distributing electrical currents for internal combustion engine ignition." J. J. ROBSON. June 24th.

14,491. "Improvements in high tension magnetos." M. A. CODD. June 24th.

14,494. "Improvements in electrical ignition apparatus for use with internal combustion engines." A. L. CLIBURN and G. THOMPSON. June 24th.

14,567. "Improvements in electrically-operated electric switches." A. ECKSTEIN, A. C. HEAP and D. B. MELLIS. June 25th.

14,572. "New and improved detector switch for electrically detecting the position of railway points." T. E. HAYWOOD and MCKENZIE & HOLLAND, LTD. June 25th.

14,594. "Improvement in electric tramcars." J. O. MILLARD. June 25th.

14,630. "Improvements in or relating to the regulation of electric circuits, and to means therefor." SIEMENS-SCHUCKERTWERKE G.m.b.H. (Date applied for under Patents Act, 1901, June 26th, 1906, being date of application in Germany.) June 25th. (Complete.)

14,697. "Improvements in electromagnetic appliances for playing pianos and other musical instruments." F. SCHUBBE. June 25th. (Complete.)

14,638. "Improvements in medical batteries." C. W. TAYLOR. June 25th. (Complete.)

14,649. "Improved electric battery." A. WYLTS and F. JEUDI. (Date applied for under Patents Act, 1901, June 28th, 1906, being date of application in France.) June 25th. (Complete.)

14,681. "Improvements in electrical measuring and recording instruments." T. E. SLAUGHTER and H. T. HARRISON. June 25th.

14,713. "Improvements in arc lamp electrodes." H. S. HATFIELD and F. M. LEWIS. June 26th.

14,725. "Improvements in or relating to electrical potential regulators or speed controlling devices." SIEMENS BROS. DYNAMO WORKS, LTD. (Siemens-Schuckertwerke, G.m.b.H., Germany.) June 26th. (Complete.)

14,752. "Improvements in protective means for electrical circuits." C. F. SCOTT. (Date applied for under Patents Act, 1901, July 9th, 1906, being date of application in United States.) June 26th. (Complete.)

14,753. "Improvements in protective and phase-adjusting means for electrical circuits." C. F. SCOTT. (Date applied for under Patents Act, 1901, July 9th, 1906, being date of application in United States.) June 26th. (Complete.)

14,756. "Improvements relating to secondary batteries." R. ZIEGENBERG. (Date applied for under Patents Act, 1901, August 10th, 1906, being date of application in France.) June 26th. (Complete.)

14,762. "Improvements relating to secondary batteries." R. ZIEGENBERG. (Date applied for under Patents Act, 1901, August 11th, 1906, being date of application in France.) June 26th. (Complete.)

14,765. "Improvements in ignition devices for internal combustion engines." THE SIMMS MANUFACTURING CO., LTD., and A. H. D. ALTREE. June 26th.

14,766. "Improvements in ignition plugs." THE SIMMS MANUFACTURING CO., LTD., and A. H. D. ALTREE. June 26th.

14,797. "Improvements relating to boxed electric switches, fuses and the like." VERITYS, LTD., and A. E. GOTT. June 27th. (Complete.)

14,802. "Improvements in or relating to magneto-electric machines." P. R. VAN HAGA. June 27th. (Complete.)

14,831. "Improvements in prepaid hour-meters for electricity." W. B. THORPE. June 27th.

14,838. "Improvements in or relating to the compounding of alternate current dynamo-electric machines." SIEMENS BROS. DYNAMO WORKS, LTD. (Siemens Schuckertwerke G.m.b.H., Germany.) June 27th. (Complete.)

14,839. "Improvements in or relating to electric switches or cut-outs." SIEMENS BROS. DYNAMO WORKS, LTD., and C. M. TOPLIS. June 27th. (Complete.)

14,847. "Improvements relating to the electrodes for search lights." GEBRUDER SIEMENS & Co. (Date applied for under Patents Act, 1901, September 26th, 1906, being date of application in Germany.) June 27th. (Complete.)

14,876. "Improvement in and relating to dynamo-electric machines." J. E. NOEGGERATH. (Date applied for under Patents Act, 1901, June 30th, 1906, being date of application in United States.) June 27th. (Complete.)

14,881. "New excitant for primary batteries." A. W. SOMERS and R. J. CROWLEY. June 29th.

14,917. "Improvements in shaft couplings, particularly for use in connection with the ignition devices of internal combustion engines." HUMBER, LTD., and R. H. ROSE. June 29th.

14,930. "Method of and materials for connecting together certain conductors of electricity." J. G. LORRAIN. (F. Bolling, Germany.) June 29th

14,935. "Improvements in the distribution of electric currents in the three-and-more wire systems." T. TORDA and L. TORDA. June 29th. (Complete.)

14,990. "Improvements in and relating to electric motor control." BRITISH THOMSON-HOUSTON CO., LTD. (General Electric Co., United States.) June 29th.

15,009. "Improvements in alternating current electromagnets." FELTEN and GUILLEAUME LAHMEYERWERKE ACT.-GES. (Date applied for under Patents Act, 1901, April 2nd, 1907, being date of application in Germany.) June 29th. (Complete.)

15,012. "Improvements in or relating to coils for electrical purposes." S. J. Ross. June 29th.

15,016. "Apparatus for facilitating and checking code telegraphy." A. TRACEY. June 29th.

15,017. "Improvements relating to electric incandescence lamps with metal filaments." H. KUZEL. June 29th. (Complete.)

15,023. "Improvements in or relating to electrical contact makers or counters for turnstiles." I. FLUEGELMAN. June 29th. (Complete.)

15,028. "Improved construction of electric lamp." T. WARD and M. COOPER. June 29th.

15,050. "Electric fire and burglar alarm, automatic or otherwise, portable or otherwise." J. YATES. June 29th. (Complete.)

15,058. "Improvements in apparatus for separating iron and other magnetically permeable metals from flour, grain and the like." F. KING. June 29th.

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. THOMPSON & Co., 322, High Holborn, W.C., and at Liverpool, price, post free, 9d. (in stamps).

1906.

ELECTRIC TRANSMISSION OF POWER FOR VEHICLES AND OTHER PURPOSES. T. Parker. 5,570. March 7th.

CONTROL OF ALTERNATING-CURRENT MOTORS OF THE INDUCTION TYPE. British Thomson-Houston Co. (General Electric Co.) 13,285. June 8th.

DYNAMO-ELECTRIC POWER TRANSMISSION MECHANISM. British Thomson-Houston Co. and B. Hopps. 13,414. June 11th.

DYNAMO-ELECTRIC MACHINES. S. C. Lincoln. 13,427. June 11th. (Date applied for under International Convention, June 27th, 1905.)

APPARATUS FOR CONTROLLING ELECTRIC MOTORS. Siemens Bros. & Co. and F. Turner. 13,567. June 13th.

ELECTRIC SIGNALLING OR TELEGRAPH APPARATUS FOR USE ON VEHICLES. R. B. North. 13,594. June 13th.

INCANDESCENT ELECTRIC LAMPS. British Thomson-Houston Co. (General Electric Co.) 13,596. June 13th.

APPARATUS FOR STARTING AND REGULATING ELECTRIC MOTORS. G. C. Fricker. 13,673. June 14th.

ELECTRIC MOTOR-GENERATORS. H. Leitner. 13,782. June 15th.

ELECTRIC MOTOR-GENERATORS. H. Leitner. 13,782A. June 15th. (Date applied for under Rule 5, Patents Rules 1905, June 15th, 1906.)

ELECTRIC MOTOR-GENERATORS. H. Leitner. 13,782B. June 15th. (Date applied for under Rule 5, Patents Rules 1905, June 15th, 1906.)

APPARATUS FOR THE ELECTRICAL PRODUCTION OF HEAT FOR COOKING AND OTHER PURPOSES. A. F. Berry. 13,795. June 15th.

METALLIC FILAMENT FOR ELECTRIC GLOW LAMPS AND METHOD OF TREATING SAME. P. M. Justice. (Deutsche Gasglublicht Akt.-Ges.) (Auerges.) 13,956. June 18th.

TEMPORARILY-ACTING MAKE-AND-BREAK DEVICES FOR ELECTRIC CONTACT APPARATUS. J. V. Wengelin. 13,969. June 18th.

ELECTRIC SWITCHES. J. H. Tucker. 14,006. June 19th.